INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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IN THIS ISSUE

The camp season is at hand, and since many teachers assist in boys' camps as councilors, and as teachers of camp crafts, the June issue has been devoted to projects that may serve both in the camp and in the school shop. The projects offered will be equally interesting to the teacher who is engaged in boy-scout work. At least two of the articles — the one on the flat bow and the other on the pack frame — were written by men who spend much time in assisting boy scouts with their woodwork. The other projects on fly tying, the canoe, the wall plaques, and the log cabin will be found helpful in making the boys' stay at the camp this summer interesting, entertaining, helpful, and educational.

THIS MONTH'S COVER

The picture chosen for the cover of this issue shows how the aluminum ore (bauxite) is mined by the open-pit method.

In this particular method of mining, the top dirt is removed. Then dynamite is used to break up the bauxite, after which it is loaded into mine cars.

Photograph (by Margaret Bourke-White), courtesy Aluminum Company of America.

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If our circulation department receives this information promptly the readers will not have to miss any issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

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Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."

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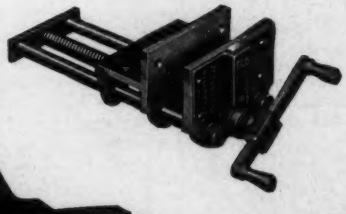

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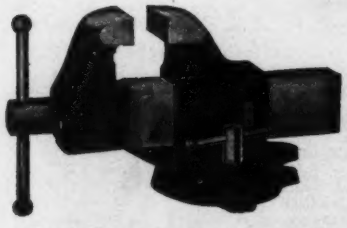

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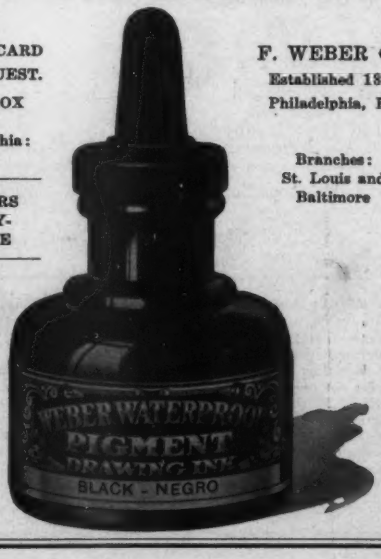

TRACING SUPPLEMENT No. 312, June, 1935
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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DETROIT

HOW TO READ THE STEEL SQUARE

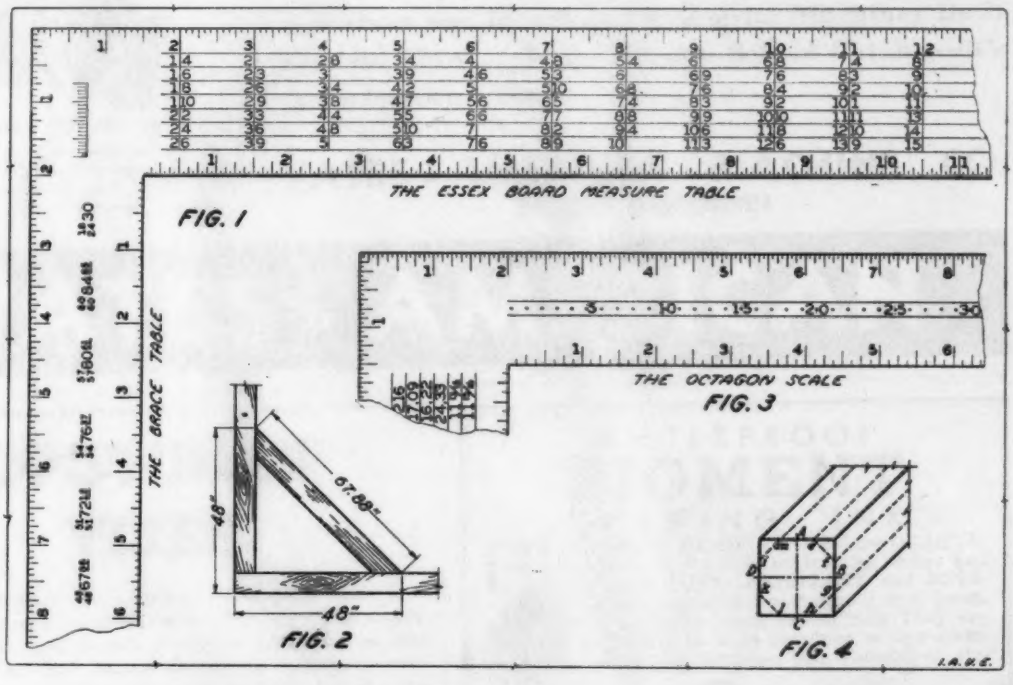
K. L. Julson, Monroe School, Butte, Montana

The Essex Board Measure Table

This table, giving the number of board feet contained in a board, is found on the back of the framing-square blade. The inch graduations along the outside edge of the blade represent widths in inches, and the figures in the column under 12 give the lengths of the boards in feet. See Figure 1. Use the table in determining board measure by finding the length of the board in the column under 12 and moving along the line on the square to the column under the figure giving the width. The figure at the point of intersection gives the answer in board feet and twelfths of a board foot. For example, to find the number of board feet in a board 8 in. wide and 10 ft. long, locate the figure 10, which is the length, in the column of figures under 12 and move to the left, stopping under the number 8, which is the width of the board. The figure at this point is 6|8 and is read as 6 8/12 board feet. The procedure may be reversed by using the figures under 12 as widths, and the inch graduations along the outside edge of the blade as lengths. For stock more than 1 in. thick, multiply the answer by the thickness in inches.

The Brace Table

This table is found along the center of the back of the tongue and gives the lengths of some of the more common short braces. To use the brace table, determine the run and the rise of the brace and locate these figures, if they appear, on the table. The two numbers appearing one above the other represent the rise and run, and the number alongside these gives the length of the brace.



Thus, to find the length of the brace in Figure 2, look on the table for the figure 48. They appear in the group $\frac{48}{48}$ 67.90 which means that the brace for a run of 48 in. and a rise of 48 in. must be 67.90 in. long.

The Octagon or Eightsquare Scale

This scale is found along the center of the face of the tongue, and is used to lay out the lines in cutting an eight-sided column from a square piece of timber. Use the scale by taking, with a dividers, as many divisions on the scale as there are inches across a side of the timber.

On the end of the timber lay off this distance each

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way from the centers of all sides. Connect these points with straight lines. Example: Make an octagonal post from a 12 by 12 in. timber. With a dividers, take 12 divisions off the scale and lay this distance off on each side of the centers ABCD. Connect the points **ef**, **gh**, **ik**, and **lm** as shown in Figure 5.

The Rafter Table

This table appears on the face of the blade. At the left end of the blade are the headings designating the purposes of the different rows of figures. The first row gives the length of the main rafter for each 12 in. run. The second row gives the length of the hip or valley rafter for each foot of run of the main rafter. The third line gives the length of the first jack rafter and the difference in length of each succeeding jack when spaced 16 in. on centers. The fifth line shows one of the figures to use on the steel square in laying out the side cuts of the jacks, while the last row gives the figure to use on the blade of the square in making the side cuts of the hip or valley rafters.

The inch graduations along the outside edge of the blade represent the rise in inches of the main rafters for each 12 in. of run. Thus, all the figures dealing with a roof with 8 in. of rise to each 12 in. of run, or 1/3 pitch, will be found in the column under the 8 in. mark, etc. To use the table, determine the desired pitch and locate on the blade of the square the number giving the corresponding pitch, and use the figures in the column under this number for all the calculations for this pitch. For example, all the information needed to frame a roof of 1/4 pitch will be found in the column of figures under the 6 in. mark.

Obtain the length of the main rafter by looking in the first row under the number giving the correct pitch and multiplying the figure found there by the number of feet in the run. Example: Using a building 20 ft. wide and a 1/4 pitch for all calculations, find the length of the main rafters. In the first row, under the 6 in. mark, the figure 13.42 is found. Multiply this by 10, giving 134.2 in. which is the correct length.

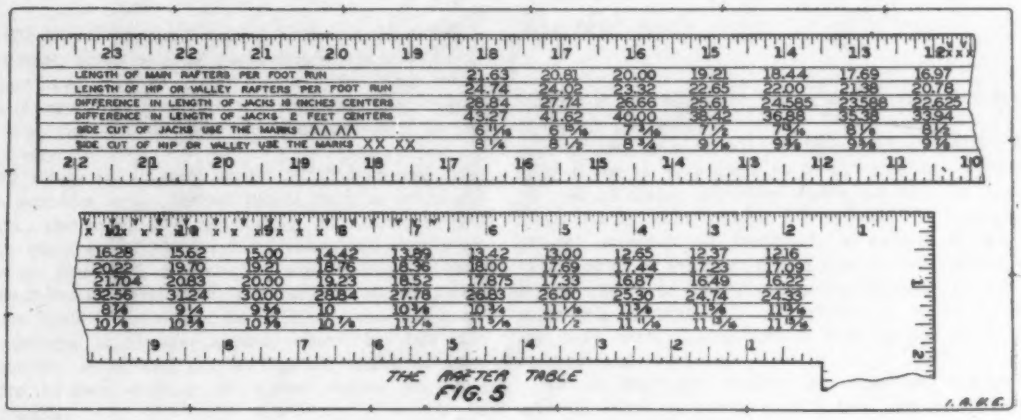
The length of the hip or valley rafter is obtained by multiplying the figure found in the second row by the number of feet in the run of the main rafter. Example: The figure in the second row under the 6 in. mark is 18, which multiplied by 10 gives 180 in., the length of the hip or valley.

Obtain the lengths of the jacks by using the figure found in the third line, which is the length of the first jack placed 16 in. from the corner. The length of each succeeding jack, when spaced 16 in. on centers, is found by adding this figure to the length of the preceding jack. Example: The figure found in the third row under the 6 in. mark is 17.875 in. plus 17.875 in., and so on.

When the jacks are to be placed 24 in. apart, use the figures in the fourth row in the same way.

Determine the side cut of the jack rafters by using the number found in the fifth line on the blade and 12 on the tongue and mark along the tongue. Example: Under the 6 in. mark in the fifth row is found 10¾. Using 10¾ on the blade and 12 on the tongue, and marking along the tongue, gives the side cut of the jack rafters.

Obtain the side cut of the hip or valley rafters by using the figure found in the last line on the blade and 12 on the tongue and mark along the tongue. Example: The figure in the last row under the 6 in. mark is 11 5/16. Use this number on the blade and 12 on the tongue and mark along the tongue.



THE RAFTER TABLE
FIG. 5

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Summer-Camp Projects

Stephen Henry Hurtuk

Director Arts and Crafts,
Cedar Crest Camp for Boys, Oakland, Maine

With the camping season approaching, teachers preparing to serve as camp councilors may find valuable suggestions in this article.

CAMPERS are looking for something to make which is different, rather than the duplication of the same things which they have made in school and at home. They would like greater novelty and a much wider variety. The average camper soon tires of the same old thing presented in the same old way.

Making things has a great appeal to all boys and girls. Creative activities under various names, such as industrial-arts work, shopwork, arts and crafts, etc., take a very important place in summer-camp activities, and rightly so. The average camp has an arts-and-crafts building or shop with a councilor in charge where the campers can make anything from boats to radio sets. In addition, some camps are so far advanced as to have a place where they can take an automobile apart and put it together again, or even investigate the inner workings of airplane engines, practicing on old models.

A camp program should not be one-sided so that worthwhile camp activities are neglected, and the good camp director does not allow his program to go off at a tangent, but he plans for his campers to have as many worth-while experiences as possible while they are at camp. Therefore, arts-and-crafts work comes into its rightful place on the program. It is essentially an individual type of activity but one which gives the individual an opportunity to do something which will become a pleasant memory of the camp season. A camp program strikes a balance between directed activity and personal liberty. Even in directed camp activities a certain amount of freedom ought to be possible. A willingness to regard the wishes of the campers should be shown by the leader.

Exhibit of work done at Cedar Crest summer camp of 1934

In our own case, we have found our arts-and-crafts department to be of very great value and interest to practically all campers during the entire season, not only for its present value but its value in later life as well. The transfer value of such activities will frequently be evident in later years as a source of avocational and recreational interest. Many people today are finding refuge and comfort in hobbies — something pleasant that one chooses to do at the end of the day's work. These hobbies may be discovered in the summer-camp workshop.

Not so long ago, leaders for organizing arts-and-crafts activities were considered easy to find, and no great adjustment to the camp situation was thought to be necessary. It was all too easy to transfer to the camp the same crafts taught in schools with similar methods of teaching. But such a course today would mean the decline of all interest and enthusiasm in the work. A great deal depends upon the leader. Special skill, training, and experience are essential. He should be especially prepared for the work, enthusiastic over the activity itself and over life in general, and have the ability to keep the campers carrying on cheerfully to the completion of projects begun. A leader who is too dictatorial, or who does most of the work himself while the campers look on or loll around, would serve no very good purpose.

The resourceful leader will have a great number of projects on exhibit in the shop so the camper may examine them before deciding how he will utilize the great amount of energy, which seems to be ever present, in doing something which will please his creative urge.

There are so many interesting possibilities when we consider actual projects to be made by the camper that it has always seemed best to us to offer as many examples as possible from which to choose. A sampling from as many types of work as possible should be in the shop for the camper's examination before a decision is made as to what he will do, the suitability of the chosen project receiving first consideration. In this exhibit might be found many examples of woodwork, leather work, jewelry and metal projects, simple furniture, baskets, bags, scarves, rugs from woven fiber, etching, brushes, finger painting, inlaying, bead weaving, snake- and lizard-skin articles, braided articles, and the like. The camper should be allowed to examine and handle these projects and ask questions before deciding what he wishes to make.

Section of automobile and aeronautics shop at Cedar Crest Camp

Interest in arts and crafts is not confined to boy campers. Many crude creative efforts at camp have furnished the basis for a permanent adult interest, either avocational or vocational, for girls as well as for boys.

We believe adequate equipment is very important. It need not necessarily be expensive, but should be suitable to the ability of the group handling it. Young children should not be allowed to use too heavy, too sharp, or too long-handled tools, but should be given for learning purposes small, safe tools until certain fundamental skills have been mastered.

We find in almost every camp the usual projects made from wood. Of these, there are a great many very fine examples and they offer worth-while projects which every camper should sample. We make a very large number of such projects each summer. As they seem to be familiar to most teachers, they need not be mentioned here. Some of the newer projects which have found favor with our campers will be described briefly below:

Leather Work. Leather work is easily adapted to the age and skill of the camper, and it increases in popularity each year. This work is easily presented to a group, selecting projects which give instruction in fundamental principles of leather working. During the demonstration, handling of tools and leather working, step by step, should be clearly shown. The demonstration period may be followed by a period for individual instruction, using scrap leather. Allow plenty of time to try out the tools and inspect the exhibit. A general discussion will clear up many questions. Leather is such a splendid medium that we feel it should have a wider use in camps. Beginning tools need not be expensive. Many of the decorating tools can be made in the shop. Moccasins, bridge sets, billfolds, purses, bags, picture frames, and book covers, are some of the things which can be made readily in camp.

Snake and Lizard Projects. Many really beautiful things can be made from snake and lizard skins. The same general line of procedure is followed here as in leather work. Ladies' bags, card cases, billfolds, cigarette cases, and book ends are a few examples of projects. These skins may be obtained with beautiful markings and lend themselves admirably to craft projects.

Wool Sheepskin Craft. The sheepskin craft is ideal for camp work. A number of practical things can be made, such as toy dogs, pajama dogs, ornaments, moccasins, and the like. The only equipment necessary is scissors, three-cornered needle, thread, thimble, and a wire brush for brushing the wool over the seams of the finished article.

Jewelry and Metal Work. The simpler projects in metal working or jewelry making are the most popular in camp. The work done is quite simple in character but is always greatly valued by the campers and their parents. Copper, silver, and semiprecious stones are used in making rings, bracelets, cigarette cases, necklaces, bowls, vases, and trays. The new craft metals — brass, copper and alloy (old-gold color) — are highly malleable and easy to solder and are especially suitable for artistic projects. Only simpler tools are needed for beginning work. Craft copper sheeting suitable for covering wooden panels, boxes, book ends, etc., can be very effectively decorated by "tapping in" the design. The only tools needed here are a punch and hammer.

Weaving with Fiber. A comparatively new craft is that of weaving tops for stools, chair seats, wastebaskets, door mats, etc., from fiber which comes in a large assortment of colors. It is especially made so as to be practically nonstretchable. Geometric designs of many kinds may be woven, carrying out beautiful color designs. Inexpensive frames may be obtained all ready to be assembled and stained for this work. The colors of the fiber are washable. Fiber is preferable to cane or reed because of its bright color and texture.

Loom Weaving (shuttle weaving). Girl campers are especially interested in this activity although it is not necessarily confined to girls. Many camps keep several looms busy all summer. Countless beautiful patterns are possible by using colored warp combined with two shuttles and "inlay" weaving. Looms come in different sizes at modest cost, and weave any textile material, such as linen, wool, silk, cotton, fiber, and beads, in straight or diagonal patterns. Such articles as scarves, luncheon sets, bags, ties, belts, bracelets, and necklaces can be made. Weavers may make their own patterns, furnishing a lesson in color harmony and design.

Braiding. Braiding is a fascinating craft, and so many articles can be made from braids that most campers will want to learn it. A variety of materials may be used for braiding, such as leather, cord, fiber, wool, and the like. Simple as braiding is after one learns it, some braids require the beginner's closest attention at first. There are a number of styles of braid, and they are especially adapted to quirts, lanyards, hat cords, dog leashes, rugs, belts, and bags.

Finger Painting. This is done with plastic paint of pure colors. It contains the brilliant tones and easy mixing qualities of oil paints with the easy washing-out qualities of water-color paints. This is especially liked by the younger campers. It is applied with the fingers, using any desired motion. If the first result is not satisfactory, simply wipe off with a damp cloth and start over again. It can be made permanent by spraying with shellac.

Inlaying. Beautiful wood plaques may be made from an assortment of wood veneers. The plaques may be obtained already stamped or ready for original designs. The veneers are selected for their beauty and the only tools needed are a special knife, glue, lacquer and sandpaper. Effective stamped designs are sailboats, galleons, waterfall, airplanes, and the like.

Brushmaking. A new and popular activity is that of brushmaking. A wide variety of brushes can be made, such as nail brushes, novelty brushes, witch brooms, clothes brushes, hat brushes, crumb brushes, radiator brushes, fireplace dusters, and a great many more. The fiber for these brushes comes in a dozen or more bright colors. The backs and handles for the brushes are obtained with holes pierced ready for weaving fiber into place with wire. The brush backs may be finished by etching, painting, or decorating in any number of ways. These brushes make very attractive, useful, and substantial articles when completed.

Electric Wood Etching. Wood etching with an electric needle is becoming popular as a new craft. The wooden panels or pieces are supplied with the essential lines stamped, so that the beginner can readily complete the project. Unstamped pieces are supplied for those wishing to develop

their own designs. By using the hot electric needle as a pencil, and following the lines, a rich antique effect is obtained. The designs may be shaded as much as desired. Beautiful novelty boxes, trays, book ends, frames, and the like, may be made in this manner.

There are so many things within the possibilities of the arts-and-crafts department that it seems we should give the camper the opportunity this summer to do something at camp that will be not only thrilling at the moment, but of real benefit to him in later years.

Mechanical Typesetting Machines

R. Randolph Karch

Arsenal Junior High School,
Pittsburgh, Pennsylvania

A related-materials subject lesson for the printshop. Teachers of all shop subjects must embellish their courses with more and more material similar to that contained in this article.

KEYBOARD line-casting machines are especially adapted to casting "body matter" and the smaller display faces. The advantages of the line-casting machine over hand composition are many. A few of these may be enumerated as follows:

1. Machine composition has four to five times the speed of hand composition.

2. There is no distribution. Dead matter is melted over again into pigs, and fed into the machine again to cast more slug lines.

3. New type is used on each job, insuring a sharp, clear print on all work.

4. Machine slugs are easy to handle. A solid line of type will not "pi."

5. It is easy to repeat a given line. Duplicate lines may be cast without extra keyboard work, at a speed of six lines a minute. This, in some instances, eliminates the necessity of duplicate printing plates.

Divisions. Line-casting machines have four main parts: the keyboard, the magazine, the casting mechanism, and the distributing mechanism.

The *keyboard* (1). The sole duty of the man operating the line-casting machine is to operate the keyboard. As he taps the keys of the power-driven keyboard, *matrices* are released from the *magazine* (2) and fall in order in the *assembling elevator* (3), which is the "stick" of the machine. (Numbers within parentheses refer to circled numbers in Figure 3.)

After the operator has set one line of matrices, he presses the *assembling-elevator lever* (4) which raises the assembling elevator and delivers the line of matrices to the casting mechanism. The operator is then finished with this line, and immediately starts the next.

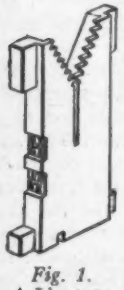

Fig. 1. A Linotype matrix

A *matrix* is a small piece of brass which acts as a mold in casting the line. Matrices for 14-point and smaller are of the two-letter-variety, as shown in Figure 1, which illustrates the actual size. By moving a little lever on the assembling elevator, the operator has a choice of roman and italic, or light face and bold face, according to the font of matrices, from the same magazines.

The *spaceband* is used between words on the line-casting machine. It is made up of two edges. One is held rigid, while the other is forced upward. This makes the spaceband gradually wider. In this way all lines of matrices are justified automatically by the machine. Figure 2 shows a line of matrices being justified by the spacebands.

The *magazine* (2) is the flat matrix receptacle tapering in shape on the top of the machine. One to six magazines are contained on one machine, according to the make and

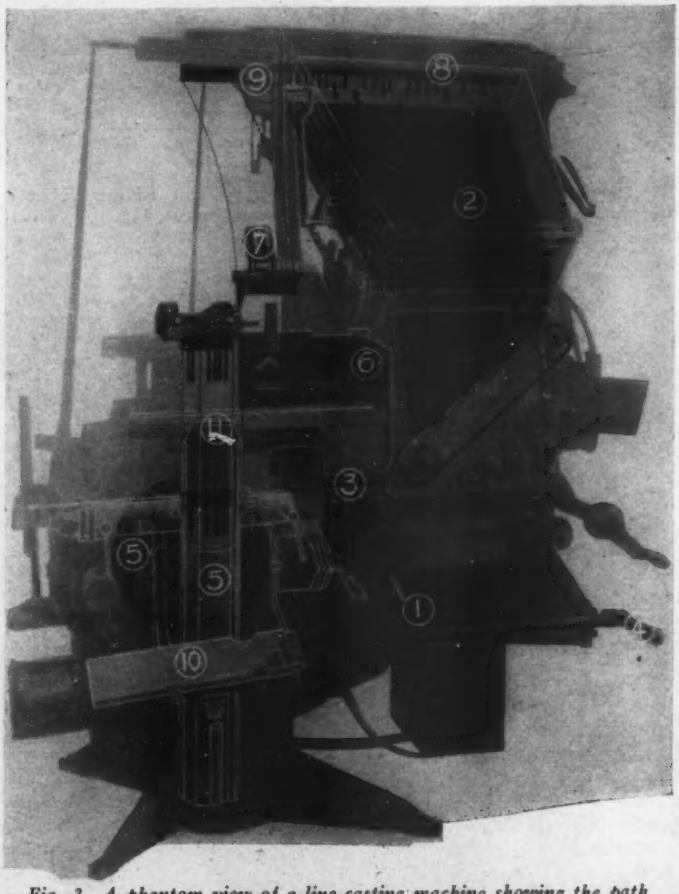

Fig. 3. A phantom view of a line-casting machine showing the path of matrices through the machine. The parts of the machine are as indicated: (1) keyboard, (2) magazine, (3) assembling elevator, (4) assembling-elevator lever, (5) molds, (6) spaceband box, (7) second elevator, (8) distributor screws, (9) distributor box, (10) galley, (11) first elevator

model. Shifting to another magazine is a simple matter on the late models. See Figures 4 and 5.

The *casting mechanism*. The line of matrices, upon being delivered to the casting mechanism, is lowered by the *first elevator* (11) between two jaws, where the line faces a mold. Molten type metal is forced into the mold from the rear, and a slug is cast, and cools instantly. As the slug is ejected from the mold it is trimmed on the sides and bottom, and is delivered to the *galley* (10).

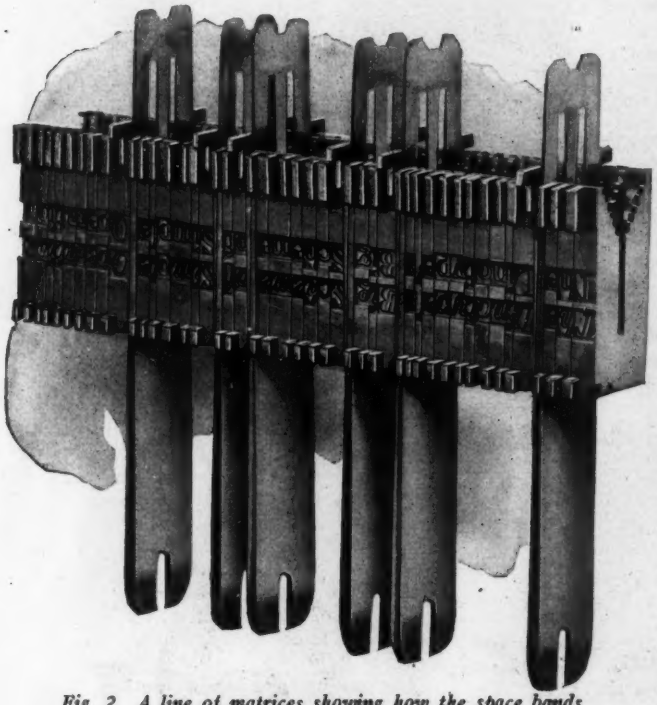

Fig. 2. A line of matrices showing how the space bands automatically justify the line

Molds (5) are adjustable to cast lines of varying length and thickness. Some machines are equipped to cast lines either 30- or 42-pica measure. Wider lines are made up of "butted" slugs — two or more for each line.

The *distributing mechanism*. After the line is cast, the matrices and spacebands are separated, the latter being carried to the *spaceband box* (6), directly above the assembling elevator. The *second elevator* (7) descends from the top of the machine, and the matrices are shifted from the first elevator, their teeth engaging with the teeth on the second-elevator bar. The second elevator then returns to the top of the machine, above the magazine, where the matrices are shifted to the *distributor screws* (8), which carry them along the *distributor bar*, which consists of a grooved rail, the teeth of the matrices aligning with and adhering to the rail. The teeth on the distributor bar vary in number and arrangement at different points along the bar, where the matrices, meeting the correct combination of teeth, drop back into the channels whence they came.

Sizes of type. Line-casting machines cast slug lines from 5-point to 36-point, and condensed faces to 60-point.

Leading is accomplished by casting a small size of type on a larger body. *Errors* can be corrected only by casting an entirely new line of type.

Border, rule, and decorative material can be cast on line-casting machines from matrix slides and border matrices.

The *Ludlow Typograph* is a system of casting display lines of type with hand-set matrices. It is not adapted to the setting of small sizes of types for body matter. The advantages of the Ludlow system over hand-set type are as follows:

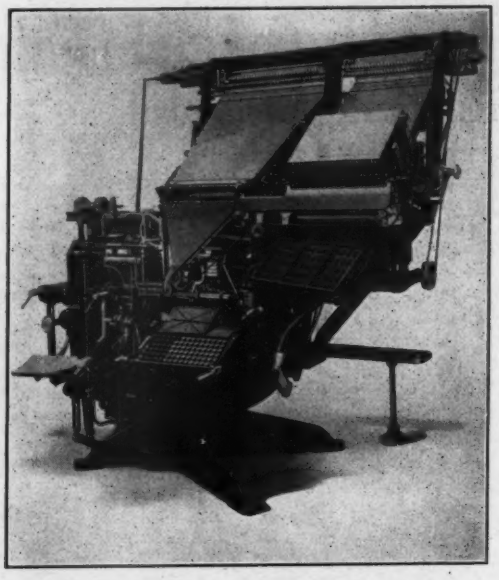

Fig. 5. A model 14 Linotype, with three main magazines and one auxiliary magazine

Fig. 6. Matrices set in a Ludlow stick

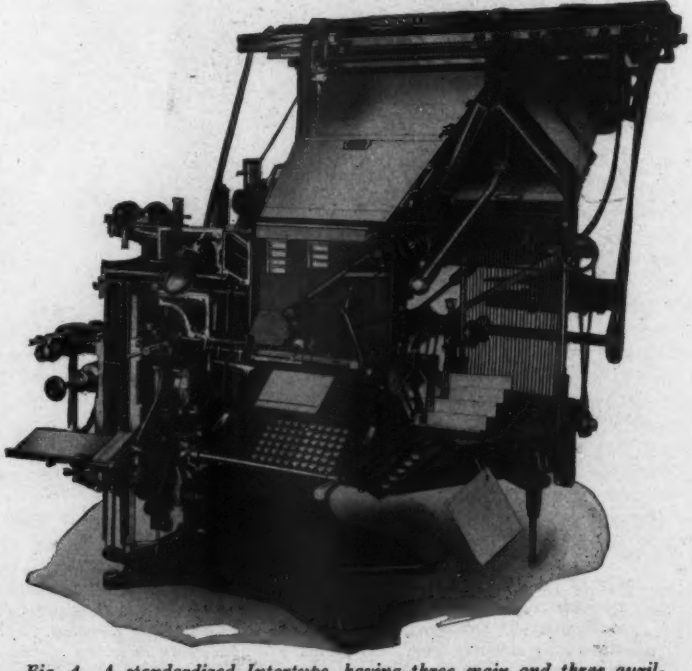

Fig. 4. A standardized Intertype, having three main and three auxiliary magazines. Six kinds of type are at the hands of the operator

1. Bright, new type in slug lines, insuring a clear print.
2. No distribution — dead slugs are remelted.
3. Unlimited supply of large type, with no large case storage necessary.
4. Recasting for duplicate forms.
5. No work-ups or pull-ups on the presses.
6. Unbreakable, full-kerning italic faces.
7. Speed in composition — the Ludlow operator picks up four or five matrices successively between his fingers and sets them in the stick. Distribution of the matrices is done in the same quick manner. Being cast in one piece, hairline justification is not necessary.

Method of composition. The work on the Ludlow is done by setting brass matrices in a special stick, and justifying as in hand composition. The matrices are locked in the measure with a thumbscrew. See Figure 6. The stick is then placed in a caster, where all type sizes are cast on a 12-point body. See Figure 7. Type faces over 12-point are cast with an overhang, being centered on the slug like a letter T. Ludlow slugs, stick, and matrices are shown in Figure 9. The overhang is built up solidly with low-cast slugs, which may be cast on the same caster as the slug lines. When sizes smaller than 12-point are used, a 6-point mold is available.

Sizes of type. The sizes of type available on the Ludlow range from 6- to 72-point. Eighty-four-point capitals can be cast, and 144-point characters can be cast individually. Rules are engraved on the backs of matrices, which act as nicks to distinguish between the different fonts.

Length of line. The Ludlow is equipped to cast either 21- or 22½-pica lines. Smaller measures are cast on one of these two widths and cut to size on a saw trimmer or slug cutter. Lines shorter than the mold can also be cast in any measure by setting "cut-off" matrices in the desired places. Lines longer than 21 or 22½ picas are cast in sections of this measure, but are justified in the long measure as one line. Figure 8 shows a 60-pica line made up of three slugs, cast in a 63-pica stick. Note the overlapping at the butted ends.

Italic. Ludlow italic faces are full-kerning in design, and are cast from slanting matrices cut on a 17-deg. angle. A special italic stick is used with italic spaces and quads. This method of casting produces a close-fitting italic letter, with unbreakable kerns. Figure 10 illustrates the italic stick and matrices.

To correct errors, an entirely new line, or section of a line, must be recast. Ludlow lines in the larger sizes must often be burnished with fine emery cloth for printing on fine enameled paper stock. Emery cloth is furnished for this purpose on the apron of the caster.

Solid composition is difficult on the Ludlow. At least a lead must be set between lines to allow them to lock up

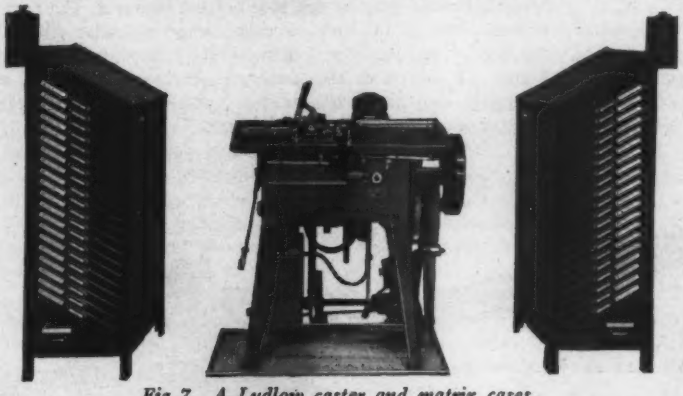

Fig. 7. A Ludlow caster and matrix cases. Space for 40 fonts is shown

Fig. 8. A 60-pica Ludlow line, cast in three slugs. Note the overhanging parts at the right ends of the first two slugs

Fig. 10. Ludlow italic matrices in an italic stick

Fig. 9. A Ludlow stick, matrices, and form

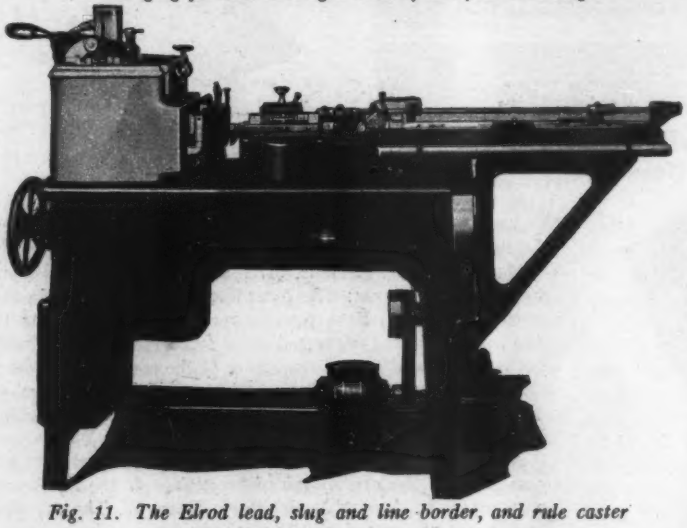

Fig. 11. The Elrod lead, slug and line border, and rule caster

Fig. 12. A Monotype keyboard

properly. Border matrices are provided for use on the Ludlow.

Low slugs make unnecessary the cutting down of quadded lines to keep them from smudging on the press. This is very often necessary with keyboard line-casting machines.

The *Elrod machine* shown in Figure 11, casts leads, slugs, and line borders in strips. The machine is automatically operated, and cuts the material to point size as required. Elrod leads and slugs are used in building up overhanging Ludlow slugs, as well as in the regular way.

The *Monotype* casts single types from hard type metal and sets them in justified lines. The monotype also casts types to be placed in cases and which are almost identical with foundry types. Leads and slugs, rule, border (both strip and individual), and metal furniture can also be cast.

Spacing. The monotype is self-spacing, as the set size (width of letter) of all characters in the same font bears a fixed relation to each other. The basic letter of the font, which is the M, is divided into 18 equal parts, and one of these parts is used as the unit of measure in determining the width of each character in the font. More than two hundred widths of spaces may be had on the monotype, and the spaces in each line are uniform in thickness.

The keyboard is operated by compressed air, and the speed is limited only by the speed of the operator. The paper ribbon, about 4 in. wide, is called the "controller ribbon," because it controls the action of the composing machine. Figure 12 illustrates the monotype keyboard. The roll of ribbon is seen above the machine, and the justifying scale is on a level with the operator's eyes.

Fig. 13. A matrix case

Fig. 16. The wedge used on the Monotype caster

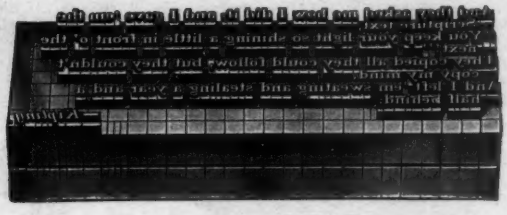

Fig. 17. A sample of Monotype composition

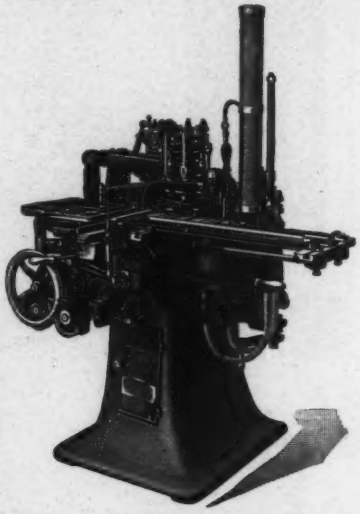

Fig. 14. The Monotype composing machine

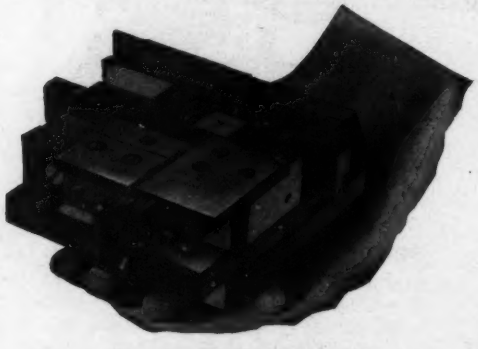

Fig. 15. A Monotype mold

The monotype system consists of two separate parts — the keyboard, and the composing machine, or caster.

The monotype keyboard contains five alphabets, the keys being arranged in standard typewriter arrangement. Certain keys are provided to control the justification of lines.

When a key is struck by the operator, two holes are punched in a roll of paper ribbon. At the same time the width of the letter struck is recorded on a "justifying scale." As succeeding letters are struck, the ribbon moves forward and more perforations are made in the ribbon. The thickness of each succeeding letter is added to the first. When the line is nearly full the operator is notified by a bell or a light. Noticing the recorded total width of all the letters in the line, the operator touches two keys, and the justification is automatically taken care of. The next line is then begun.

As the controller ribbon is run into the composing machine backwards, the width of the spaces can be determined after the line is set at the keyboard.

The *composing machine.* The action of the composing machine is as follows: The controller ribbon is placed in the machine. As the ribbon passes over the tracker, similar to that of a pianola, compressed air is forced through the holes in the ribbon and directs the action of the matrix case, which contains 225 matrices. The matrix case, about the size of a man's hand, is shown in Figure 13. A composing machine is illustrated in Figure 14.

At each revolution of the composing machine, the matrix case stops at the predetermined position over the mold, and a type is cast. A mold is shown in Figure 15. The machine casts types at a speed of 150 a minute.

The justification on the caster is accomplished by the action of an automatically shifting wedge, which is directed by the last four perforations in each line punched in the controller ribbon. A wedge is shown in Figure 16. As each letter is cast it is ejected from the mold into the rapidly forming line of type. When the line is completed it is pushed out into a galley.

Advantages. The advantages of monotype composition are as follows:

1. Nondistribution. Both hand- and machine-set type may be cast so cheaply and quickly that distribution, including all spacing material, is eliminated.

2. Flexibility. The monotype sets three faces from the same matrix case: roman, bold face, and italic. Combinations of different type faces may be cast and composed, and all types align at the bottom in the same line.

3. Corrections may be made by the hand compositor. This releases the machines for a productive job.

4. Copy fitting. Copy may be fitted to make a certain amount of pages of a determined size by increasing the space between letters. If leading is found to be necessary, this can be accomplished by merely casting the types on a larger body.

5. Tabular matter. The monotype is especially adapted to the composition of tabular matter. Several sections in a line can be justified independently of each other, and the rules set in later by hand. Difficult tabular matter is set as quickly as straight matter.

6. The controller ribbons may be saved for future runs — saving the cost of keyboard work.

7. Length of measure. Lines may be set and justified up to 65 picas wide on the monotype. A 90-pica width may be cast by using a large scale.

8. Runarounds. It is often necessary to run types around irregular engravings. In monotype composition, a quadded space is left for engravings, and after being routed down to the correct height, the printing plate is nailed fast to this quad base.

9. Sizes of types. Type sizes from 5-point up to and including 18-point may be cast from the keyboard, in justified lines. The Giant caster casts individual letters from 24-point to 72-point for the cases.

10. Variety of type faces. No other type-casting system provides so many varieties and sizes of type as does the monotype. More than 3,000 faces and sizes are available. Matrices may be rented from the "Matrix Library" conducted by the manufacturers.

11. Rule-form composition. It is not necessary to keyboard an entire rule form on the monotype. Only a small section is composed, and this is repeated for as many casts as may be necessary to complete the entire form. All composition of rule forms is done on a 12-point basis, and perfect alignment is secured through the interlocking method of setting and casting. The monotype will cast rule work at a speed of 180 sq. in. an hour.

12. A complete system. The monotype is the only system that does the job completely. It casts types, leads, slugs, rules, metal furniture, and border.

Supplementary Readings

John L. Rogers, *Linotype Instruction Book.*
John S. Thompson, *Mechanism of the Linotype.*
Mergenthaler Linotype Company, *Linotype Keyboard Operation.*
Sinclair, *The Intertype.*
Thompson, *History of Composing Machines.*
U. T. U. Library.
I. T. U. Lesson Sheets.

An Experiment in Trade English

W. E. Belleau

Milwaukee, Wisconsin

The attempt to make Trade English function more effectively as described by the author, may encourage teachers of other subjects to make similar experiments.

UNTIL a year ago the Trade English class for printers had been taught mainly through the use of lesson sheets. However, the writer found that this system did not produce the desired results, for although the boys read the instructions and rules, they did not know how to apply the latter. The majority of the students worked many exercises wrongly before they brought their work sheet to the instructor to be corrected. In this way they were not only wasting time, but also forming a wrong habit. Furthermore, some boys obtained the correct answers from other boys, for the instructor could not watch carefully the whole class and correct students' work at the same time. Although the boys were required to be prepared to explain their work, it was impossible to have them explain every sentence, for that would have required too much time. To do that work thoroughly would have taken three class periods instead of one. Therefore, students could get by to a great extent. Achievement tests administered to students who had completed the required work sheets revealed that these boys had not made satisfactory progress. Several boys were informed that they would have to take the course again the next semester when a more effective method would be used.

At the beginning of the next semester, both the boys who had failed to complete the course previously and the newly enrolled students were informed that they would all have to take several tests to determine their individual needs; that if they passed any phase of the tests with an average of 90, they would be exempted from studying it, and that it would be possible for some boys to receive credit for the course in one semester. A detailed description of the experiment will now be discussed.

Curriculum

1. Recognition of:
   - *a*) verbs, verb phrases, and verbals
   - *b*) subject, object, and predicate complement
   - *c*) phrases and clauses
   - *d*) parts of speech
2. How to use the dictionary
3. Sentence structure
4. Noun: number, gender, and case
5. Capitalization
6. Abbreviations, contractions, and italics
7. Spelling and syllabication
8. Comparison of adjectives and adverbs
9. Prepositions and conjunctions
10. Verbs:
    - *a*) tenses
    - *b*) forms frequently confused
11. Pronouns:
    - *a*) Personal
    - *b*) Demonstrative
    - *c*) Interrogative
    - *d*) Relative
    - *e*) Indefinite
    - *f*) Reflexive
    - *g*) Possessive
12. Punctuation:
    - *a*) end punctuation
    - *b*) comma
    - *c*) semicolon
    - *d*) colon
    - *e*) dash
    - *f*) quotation marks
    - *g*) brackets
13. Paragraph: unity, coherence, and emphasis
14. Letters:
    - *a*) application
    - *b*) recommendation
    - *c*) ordering goods
    - *d*) itemized bills
    - *e*) collection
    - *f*) personal
15. Business forms:
    - *a*) letterheads

b) checks
c) receipts
d) promissory notes
16. How to advertise for work and for help
17. Telephone
18. Telegrams
19. Outside reading concerning the printing trade

Materials

1. O'Rourke, *Self-Aids* (Educational and Personnel Publishing Co.)
2. Horn and Ashbaugh, *Fundamentals of Spelling*, grades 1 to 8 (J. B. Lippincott Co.)
3. Several grammar books used for reference work.
4. Exercises and examination papers by the instructor.

Grouping Within Class

As a basis for grouping the students into two nearly homogeneous groups, the Otis Self-Administrative Mental Test, the University of Iowa Standard Tests and Scales — Grammar Test Form 1, and the writer's test on functional grammar were administered to the class. The intelligence quotient of the 27 students ranged from 82 to 121, the average being 99.3. The average scores on the Iowa Test were 24.6 for giving the correct principles involved, and 30.2 for writing sentences correctly. As a result of these tests, 18 boys were placed in the normal group, and nine in the retarded. This practically meant that the advanced group would complete the course in one semester, while the retarded group would take longer.

Method

The method used with the advance group will be discussed. The boys were informed that it would be impossible for many of them to complete the required work in one semester unless they were willing to study at home. The subject matter was studied by phases according to the order outlined in *English Curriculum for Printers*. After listening to the explanation and discussion of a phase, the students worked several exercise sheets. However, after a boy had worked one exercise, he had it corrected to see that he understood what he was supposed to do. Accuracy was emphasized. In the study of pronouns, verbs, and punctuation, the class did a great deal of blackboard work before they proceeded to write the exercises. After the group had completed the required work for a particular phase, they were administered a test on which they had to obtain a grade of 90. When a boy had completed his work on a phase, he was permitted to study his spelling, until all of the boys were through, according to the method described in the Horn-Ashbaugh speller. In this manner, no boy wasted his time while waiting for the others to complete the work, so that all could take the test together. So as not to hinder the good students, the slower boys were required to work at home. They had all been informed that if they did not keep up with the average of the class or if they got behind in three tests, they would be demoted to the slower section. When a boy failed to pass any test, he was given additional exercises to work at home, and later administered another examination after school. Generally the boys who failed in a test came voluntarily to obtain special help after the last recitation period.

Once a month the students wrote a spelling test. An accurate list of the words misspelled was handed to the instructor, and at the end of the semester each student had to be able to spell correctly all the words he had misspelled in the test. All the words of the Horn-Ashbaugh speller were included in the course.

Grading

The students were graded entirely on their marks on the twenty phases, and on a general final examination. It was necessary to receive a grade of 90 on the final examination as well as on the phase tests. Nevertheless, a boy's final grade was not always 90 or above, for one point was deducted from his final grade for every time he failed to pass a test. Moreover, a student failed the course unless he received a final average of 80. Therefore he could fail at least ten of the phase tests once and still pass the course.

Illustrations of Phase Tests

Conjunction Test

1. The success of your son seems (as — like) a fairy tale.
2. Neither the cat (or — nor) the dog was friendly.
3. Mr. Brown was not nearly (so — as) successful (as — so) his brother.
4. We knew that he would come (and — and that) we would win.
5. I read in a magazine (that — where) Germany had invented a new airplane.
6. The owner asked (whether — if) or not you wanted to buy the house.
7. He died (so — so that) we might live.
8. John argued with his sister, (and — while) Mary kept quiet.
9. The game had scarcely begun (when — than) two men were injured.
10. It was a very warm day (and — but) I decided to go.

Punctuation Test

1. If we succeed the principal will be happy
2. Yes John you are right but I didn't know it
3. He was displeased in fact he was afraid
4. Get out of the way yelled his father
5. Our annual meeting as you know will be held next Monday
6. We bought the poor little fellow a bat a ball and a glove
7. Myrtle Jones his secretary has gone to lunch
8. We have failed in our mission therefore let us disorganize
9. Mr. Thompson who is president of the club will speak to-night
10. I shall do three things this summer attend school in the morning work in the afternoons and play tennis in the evenings

Adjective and Adverb Test

1. The mail clerk felt (bad — badly).
2. Are the test papers (already — all ready) to distribute?
3. Our company had sold (more than — over) one hundred typewriters.
4. That circle is (rounder — more round — more nearly round) than mine.
5. The climate is very (healthy — healthful).
6. He enjoys tennis more than (any — any other) game.
7. The team did not play very (well — good) today.
8. The salesman sold no (fewer — less) than ten cars.
9. Is it (cheaper — cheapest) to go by bus than by train?
10. Down the street ran a man (and — and a) boy.

Pronoun Test

1. (Who — whom) did you see?
2. Give the flowers to (whomever — whoever) is ill.
3. The audience applauded (me — my) singing.
4. Father gave (we — us) boys a present.
5. Neither of the girls will sell (her — their) ticket.
6. Jessie said it was (he — him).
7. Everyone except (she — her) went to the game.
8. I met your uncle, (he — him) in the automobile.
9. The policeman knew it to be (they — them).
10. The cook said for you to divide the cookies between Mary and (me — I).

Possessive Test

1. Have you seen (John's — Johns') pencil?
2. The (chair's back — back of the chair) is broken.
3. He received ten (week's — weeks') wages.
4. Have you read any of (Burns' — Burn's) poems?
5. She had lost her brother-in-(laws' — law's) kodak.
6. For (mercys — mercy's) sake forgive me!
7. Everyone had to purchase (Reed and Kellogg's — Reed's and Kellogg's) grammar.
8. They sold only (mens' — men's) and (boy's — boys') clothing.
9. The boy bought a (dime's — dimes') worth of candy.
10. Does a comet make (its — its') appearance every year?

Recognition of Verbals Test

1. Most people enjoy to read good books.
2. Moving the piano, I injured my back.
3. His occupation is selling soft drinks at the ball park.
4. To walk rapidly is good exercise.
5. Do you like playing tennis?
6. The detective laid a trap to catch him.
7. How do you like his playing?
8. Without his helping we never would have finished the work.
9. Hearing a noise, I ran to my friend's home.
10. John's batting won the game.

Clause Test

1. My idea was that I should do it.
2. We studied that we might receive a good grade.
3. The policeman should have bought the house you sold.
4. I believe that he ran away to Mexico.
5. Everyone enjoyed his lesson because he studied it.
6. If you do not pass, you will have to remain in school another year.
7. It is true that we should have won.
8. Your child is as tall as you.
9. That he refused to come to see us is a fact.
10. The captain likes boys who can swim well.

Troublesome Verbs Test

1. I (lay — laid) down to rest after dinner.
2. Did the trip (affect — effect) your health?
3. The manager (has set — has sat) at his desk all day.
4. (Leave — Let) me go to the ball game!
5. (May — Can) John play with us?
6. He (discovered — invented) a new tube for radios.
7. (Shall — Will) you go to the opera?
8. Fido, (lie — lay) down in the corner.
9. Everyone may (except — accept) the invitation.
10. Mary (would — should) like to accompany you.

Preposition Test

1. Queen Mary did not like to part (with — from) her jewels.
2. Is John different (than — from) his father?
3. That man was angry (at — with) the mechanic.
4. The salesman would not agree (to — with) that proposition.
5. Children must be accompanied (by — with) their parents.
6. The manager sat (besides — beside) his friend.
7. She divided the candy (between — among) her two children.
8. The dog dived (in — into) the lake.
9. The little boy looks (as — like) his mother.
10. Why didn't you ask (her — for her) to play?

Class Average on Phases

1. Analysis	92	11. Other pronouns	92
2. Recognition of verbals	90	12. Troublesome verbs	93
3. Recognition of clauses	95	13. Adjective and adverb	93
4. Dictionary	91	14. Conjunctions	95
5. Sentence structure	95	15. Prepositions	91
6. Capitalization	90	16. Punctuation	94
7. Abbreviations	98	17. Paragraphing	90
8. Nouns	92	18. Letters	90
9. Verb tenses	95	19. Business forms	90
10. Personal pronouns	96	20. Spelling	100

These averages are based on the tests that students passed, whether it was their first, second, or third attempt.

Final Results

As previously stated, the students had to obtain the minimum of 90 on all tests before they were permitted to write the final examination. The average grade on the writer's final test was approximately 93. No one had below 90. On the University of Iowa Grammar Test, the average score for principles correct was 39.6 and for sentences correct 39.8. The norms for twelfth-grade pupils are 35.9 for principles and 37.2 for sentences. Two of the boys who made an average of only 35 on the Iowa test were required to review for nearly three weeks. Then they passed the test with an average of 40.

Retarded Group

The retarded group studied the same work as the normal group, but it took them longer to acquire mastery. The I.Q. of these nine pupils ranged from 81 to 105. The average was 92. The boys who had the lowest I.Q. proved to be the slowest pupils. One boy dropped the course, six completed it in eight months, and the other two in a year. As the pupils who entered the course at the beginning of each semester were divided into two groups, there were generally three groups in the class after the first semester of this experiment.

Conclusions

The boys who had studied under both methods claimed to like the new method much better than the old. There is no doubt about the expediency of using the method of homogeneous grouping within the class, but it certainly gives the instructor much more work. It would be impossible for one instructor to teach five such classes, for it necessitates a great deal of time to check the work done, to assist poor pupils, and to keep account of the various requirements.

Wood Inlay Work

Wilbur F. Douglass

Long Beach, California

A hobby which gives practical outlet to the urge for creative artistic expression.

IT HAS long been a conviction of educators that one of the most important functions of the public schools should be the preparation of children for the proper and constructive use of leisure time. The problem of adequately performing this function is growing more acute as the mechanization of industry shortens the average working day. This means that every child should be encouraged to acquire knowledge of, or skill in, one or more hobbies for which he evinces some liking or aptitude. The writer has seen this objective accomplished in the lives of many boys through the use of fine cabinet woods for the construction of inlaid pieces. This avocation need entail but little expense, and can be followed at home with the use of very few tools.

Strictly speaking, the word *inlay* implies the gouging out, according to a predetermined design, of some basic wood, and then the careful inserting of thin pieces of some contrasting wood or woods. Perhaps this definition should be liberalized to include any construction of a mosaic in wood, either in flat work like a game-table top or in turned work.

The selection of woods for inlay purposes should be on the basis of their fitness, rather than on their rarity or cost. In other words, we frequently find among native woods, which are easily obtainable, those equal to the rarest of tropical cabinet woods. Any wood selected for inlaying should have dense grain. Large water ducts do not look well in any work so closely scrutinized as inlaid mosaics. Woods chosen because of the figure in the grain, such as curly or bird's-eye maple, should be used as a background for smaller inlays, or at least in large enough pieces to give the full effect of the grain. Those woods used for the smaller elements in the design should be selected on the basis of proper color harmony.

No matter where one lives in this country, he can usually find, among local species, some woods of outstanding beauty for inlay purposes. These are often varieties which are never found on the lumber market. For example, two southern California woods, which have no superiors, either for fineness of grain or beauty of color, are the curly grained, deep

Fig. 1. In this table the checkerboard is made much more striking by inserting a thin strip of ebony between the squares. The bordering "herringbone" is made from pequia marfim (light yellow) and jacaranda (purplish brown). The triangles are pequia marfim and violetta (Gaviuna). These woods are all Brazilian. The mosaics in the corners include African ebony, orange, and Central American rosewood. Fig. 2. The construction of inlaid bowls and plaques and their turning is a fascinating avocation. The smaller bowl on the right contains approximately fifteen hundred pieces of wood, including the mosaic in its bottom. Fig. 3. The design of this table would be considerably improved by reducing the size of the suit figures. Their present size, together with the striking color contrast of the cabriuva and ebony against the maple background, combine to violate the principle of proper subordination

red burl from the roots of manzanita (*Arctostaphylos sp.*), a mountain shrub, and the satiny textured, pale yellow wood of the orange tree. The brilliant heartwood of the osage orange (*Toxylon pomiferum*), a familiar hedge tree of the southern prairie states, is another instance in point.

But the devotee of wood inlaying may wish his artistry to express an international motif by choosing the woods to be used from the ends of the earth. Such a purpose will add immeasurably to one's zest in this hobby. Careful planning will produce remarkable distributions in the geographical origins of the woods used, without violating any of the best principles of design and color harmony.

A description of all the world's hardwoods, suitable for this purpose, would fill a volume, if it were possible to make a complete list. There are unquestionably hundreds of fine tropical species, as yet unexploited, which would be admirably suited to inlay work. The following tabulation, while limited, is suggestive, and will serve to introduce the amateur to the possibilities of a delightful avocation. The lighter colored woods are mentioned first.

Sugar maple (*Acer saccharum*) is one of the most beautiful of the lighter colored, native hardwoods, because of the dense, sometimes curly grain, and the tendency to include arrested buds (bird's-eyes).

Orange (*Citrus sp.*) is very fine-grained and pale yellow in color. The best color is developed by sawing the stems into boards or strips as soon as the tree is cut. When properly seasoned, orange is a high-class inlay wood.

Holly (*Ilex sp.*) and white birch (*Betula papyrifera*) are white, fine-grained woods which take a high finish.

Nazareno (*Brosimum alicastrum*) is a hard, white Mexican species.

Satinwood (*Fagara flava*) is one of the superb woods of the world for inlay purposes, as well as other fine cabinet uses. It is yellow or orange-colored, and has a beautiful satinlike luster. West Indies.

Yellow sanders or wild olive (*Buchenavia capitata*) is often substituted for satinwood. Jamaica.

Genipapo (*Genipa americana*) is light-colored, fine-grained, and easy to work. Brazil.

Pao amarella or satinwood (*Euxylophora paraensis*) comes from the lower Amazon.

Pao rosa (*Physocalymma florida*) is called "bois de rose" in France. It is reddish, yellow, or rose colored. Brazil or Venezuela.

Ciruelillo (*Embrothrium coccineum*) has striped, pinkish wood which polishes beautifully. Chile.

Anjanajana is rose colored, hard, and with a close, twisted grain. Madagascar.

Satinwood (*Afrormosia laxiflora*) and "real" satinwood (*Zanthoxylum macrophyllum*) are two of the finest cabinet woods of Liberia, Africa.

Hawaiian mahogany or koa (*Acacia koa*) is light, almost yellowish, in color, and one of the most satisfactory inlay woods which the writer has used. It is extremely hard and consequently somewhat difficult to work.

Satinwood (*Chloroxylon swietenia*) is a beautiful, yellow, often wavy-grained wood of satiny luster. British India.

Sandalwood (*Santalum album*) is the most valuable wood of India, selling by the pound. That from the roots is the most desirable. In addition to its marked aromatic qualities, the wood is hard, yellowish brown, and close grained.

Black cherry (*Prunus serotina*) is light red, easily polished and often exhibits a figured grain.

Figured red gum (*Liquidambar styraciflua*) is this country's leading veneer wood. Although comparatively soft, its beautiful figuring makes either the end or sagittal grain highly desirable for inlay purposes, especially in turned work.

Black walnut (*Juglans nigra*) is the premier cabinet and inlay wood of our native, darker-colored species. Its dense, hard character, rich reddish brown color and susceptibility to a high finish justify its popularity. Among the foreign counterparts of native walnut may be mentioned several species of Juglans called nogal, found in Mexico and Central America; nogal (*Juglans australis*) of Argentina, which is darker than the North American species; tiger wood (*Machaerium schomburgkii*) of British Guiana, which is such a deep brown that it is almost black; Nogal (*Juglans sp.*) of Colombia; West African walnut (*Lovoa klaineana*); the beautiful black walnut of Australia (*Cryptocarya palmerstoni*); Italian walnut, which is particularly highly esteemed; Indian walnut (*Albizzia lebbek*) that has lighter streaks running through the dark wood, and is particularly prone to produce "burrs," and the walnut (*Juglans regia*) of the Himalayas and Burma, which has a beautiful, mottled brown wood.

Purpleheart (*Peltogyn porphyrocardia*) is one of the most beautiful of all fine cabinet woods. It is very hard, and when first cut is red in color. After exposure to the air, especially when oiled, it turns a deep purple. When finished it is iridescent, the color varying with the light. Central America and West Indies.

Cocobolo (*Dalbergia sp.*) is a dark, maroon-colored wood, streaked with black. It is extremely hard and fine-grained. Costa Rica.

Rosewood (*Dalbergia sp.*) is highly prized for inlay purposes. The color ranges from red to orange or purple. It tends to

darken on exposure to the air. Central America.

Caoba or mahogany (*Swietenis mahogani*) from Mexico, Central America, and the West Indies is suitable for all fine cabinet purposes, including inlay work.

Granadilla or green ebony (*Brya ebenus*) takes a high finish. Mexico and West Indies.

Rosewood or mountain torchwood (*Amyris balsamifera*) is a valuable cabinet wood of the West Indies. It is fine-grained, aromatic and takes a high finish. Jamaica.

Cuban ebony (*Diospyros tetrasperma*) is valuable for fine cabinet purposes, but is small and rare.

Majagua (*Hibiscus tiliaceus*) is bluish or greenish in color and polishes well. Cuba.

Incienso or cabriuva (*Myrocarpus frondosus*), when oiled, has the color of ripening cherries and in the raw is extremely aromatic. Argentina and Brazil.

Jacaranda (*Dalbergia nigra*) has wood of dark-brown or violet color which is hard and lustrous when finished. Brazil.

Canella sassafras (*Ocotea pretiosa*) has brownish or greenish wood. Other species of this genus and also of the genus *Nectandra* are valued Brazilian woods for fine cabinet uses.

Pao brazil (*Caesalpinia echinata*), aside from its value as a dyewood, is a beautiful, dark-red inlay wood. Brazil.

Letterwood or snakewood (*Brosimum aubletii*) is very hard, dark brown, and beautifully marked. British Guiana.

Brazilian ebony (*Sivartzia tomentosa*) is almost black and very close grained.

Angelino (*Homalium racemosum*) has heartwood which is dark olive in color and of fine, even grain. Venezuela.

Red ivorywood (*Rhamnus zeyheri*) is practically everlasting and suitable for inlay work and turnery. Union of South Africa.

Tomboti (*Excoecaria africana*) has beautiful dark heartwood, with a permanent odor. Portuguese East Africa.

Teak (*Tectona grandis*) has long been famous for its beauty of finish, as well as its enduring qualities. It is yellowish brown in color. East Indies, Burma, and India.

Rosewood of Southern India (*Dalbergia latifolia*) is dark purple with black streaks. It is in great demand for fine uses such as wood inlaying.

Adaman padouk (*Pterocarpus dalbergioides*) is deep red in color and has long been exported to Europe and America for fine uses. India.

Ebony (*Diospyros sp.*) is exported in log from Papua and other East Indian islands. Its jet-black heartwood is a striking inlay wood.

It is difficult to separate the consideration of color harmony in inlay work from a discussion of the technical phases of design, because one so frequently influences the other. With reference to the planning of a design, the most frequent error made by the amateur with little artistic sense, is the introduction of too much competition between its different elements. Rhythmic repetition is the soul of good design, but the various parts of a design should be subordinated to each other, in the order of their relative importance to the whole. A failure to do this will produce spottiness or lack of unity, and the effect upon the critic is the same as that made by a certain monotonous type of old-fashioned wallpaper. No amount of mechanical perfection in jointing or beauty of finish can erase the impression made by a basically poor design.

There are two standard types of design, suitable for the inlay artisan, which are subject to many modifications. They are the "all-over" pattern, illustrated by a checkerboard in a game-table top, and the type which has a dominating center of interest, as, for instance, a star. Sometimes the two ideas can be combined, as was done in the game-table top shown in Figure 1. In this case the four small star inlays in the corner spaces, are set in the same relative positions occupied by the suit figures on the table shown in Figure 3.

Whatever the layout which surrounds the checkerboard, it should be in keeping with, and not in any way detract from, the central feature of the game-table. The small squares just outside the corners of the checkerboard on the two tables are a reddish-orange variety of rosewood, and produce a very pleasing effect as accent marks. If they were as large as individual squares of the checkerboard, the effect would be spoiled, because of their comparatively brilliant coloring. This is a good illustration of the legitimate influence of color on design, as well as the value of judiciously used accent marks.

The effectiveness of the star design, wherever it is used, depends very largely on the massing of color tones. A striking illusion of relief work is produced by having one side of each point made of a very dark wood, and the other half of its complementary light-colored wood. To illustrate, we might suggest ebony and holly, or one of the dark purple Dalbergias and orangewood. The species used to fill in between the points should be an intermediate tone of a harmonizing color.

The problem of harmonizing the natural pigments of woods in inlay work is somewhat less difficult than that involved in the use of artificial colors. This is explained by the fact that few woods exhibit the pure primary, or even secondary, colors. The clear yellow of orangewood is a marked exception. Nearly all natural wood pigments show some of the graying effect of varying admixtures with the respective complementary colors. The result is that the danger of clashing colors is considerably reduced. The artistic effectiveness of design in inlay work will be enhanced, however, by adopting one of the following three color plans: (1) the balanced use of complementary colors, as yellow and violet, or red and green; (2) tonal arrangements of different values of the same color, for example, the browns from a dark walnut through red gum to maple, or the different grays from ebony to white birch; (3) the combining of analogous colors, that is, neighboring hues covering about one sixth of the successive spectral colors with their intervening graduations.

It need scarcely be said that one of the chief attractions in wood inlaying for the man or boy, who is thoroughly mechanical in his instincts and talents, is the opportunity it offers for fine workmanship in the fitting and jointing of sometimes very small individual pieces of wood. The difficulties involved will challenge his patience and skill. It is beyond the scope of this short discussion to mention the numerous little "tricks of the trade" which, after all, only experience and an alert intelligence can teach. But there is no other activity in which sharp tools, patience, and a creative genius will produce finer results.

The best preparation for a finish that will last is well-seasoned wood, with joints that *fit*, cemented together with a good grade of hot glue or, preferably, properly made casein or waterproof glue. The latter, perhaps, possesses more enduring adhesive qualities, and does not show the tendency to "sweat" out through the finish, as hot glue sometimes does. Obviously, the raw wood must be worked down to a perfectly plane and smooth surface before any attempt at finishing is made.

Because boiled linseed oil so enhances and enriches the natural color of woods, the writer has always made a light application, wiped off immediately, the first step in finishing. If the piece contains considerable white or other light-colored wood — which should not be darkened — one of the pure white vegetable shortening compounds may be substituted. After the oil has had a week to oxidize and dry, a coat of white shellac will seal the wood, and make a surface to which varnish will adhere, and on which it will dry satisfactorily. (Never put varnish directly on an oiled surface.) Four to six coats of high-grade varnish, each of which is allowed to dry thoroughly and then worked down with fine sandpaper while the last one is rubbed to a velvet finish with rottenstone and oil, applied with the felt from an old hat, will give the finishing touches to an achievement which will be "a thing of beauty and a joy forever."

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

The Community Youth Problem

Of great interest to teachers, supervisors, and administrators of industrial arts and vocational education may be the plan submitted by Commissioner Studebaker to Harold L. Ickes, secretary of the interior, for a nation-wide community youth program which can be put into operation promptly as a part of the works program. This proposed program of community youth service was developed by a committee appointed as a result of the nation-wide conference on youth problems held in the Office of Education at Washington, last June. Representatives of governmental agencies and educational and recreational leaders attended this conference and helped to lay the ground plans for the proposed program. It is expected that the program would keep at least two million unemployed young people engaged 42 hours a week, either with a combination of work, education, and recreation; or with education and recreation alone.

The heart of the setup in each community would be a guidance and adjustment center. The young people (from 18 to 24, who make up a large portion of our unemployed population at present) who would elect to take part in this program of work, recreation, and education, would come to these guidance centers. Each case would be individually judged. Where financial help is needed, work would be assigned. An educational program would also be set up and the applicant would be enrolled in a recreational program that would seem advantageous or interesting to him. To build up adequate facilities for undertaking this program for the unemployed youth, it would further be required for each community to organize an advisory council at the invitation of the public-school officials, consisting of such agencies as the chamber of commerce, labor unions, the churches, and the like. A canvass would then be made to discover how the schools, playgrounds, and local facilities could be utilized in carrying out this program. Each youth would receive financial assistance only when and as much as needed, up to a maximum of $20 a month, while he participated in this guidance-work-education-recreation program.

This movement to relieve unemployment among young people and at the same time build up their morale, is a piece of work in which industrial-arts and vocational-education departments of the schools are particularly suited to co-operate. The shop teachers are especially well suited to assist the young people, who, during these trying years have left the school, are unemployed, and are living at home. It would probably require considerable reorganization of teaching material and methods in some schools, and it is well to start thinking about this problem right now. Nothing will be lost if a workable plan has been outlined, even if this suggested phase of the youth movement does not materialize. If the guidance-work-education-recreation program, however, became an actuality, this forward-looking planning by the industrial-arts and vocational-education departments of our schools would pay dividends, if not in money at least in services promptly and efficiently rendered.

The Romance of the Commonplace

The average American comes in contact with so many things each day that the thought of how these articles come to serve his uses so fully, hardly ever enters his mind. Few ever think of the large amount of planning, ingenuity, labor, research, and historical lore that are tied up in even the simplest and commonest product. Analyzing roughly the many contacts with materials of all sorts which the average person makes from the time the alarm clock awakens him from his slumber in the morning until the minute when the legal or the self-imposed curfew "tolls the knell of parting day" results in a stupendous list of textiles, metals, woods, glass, organic, inorganic, natural, and synthetic substances which all contribute to man's enjoyment of life.

The teacher or the pupil who writes or draws on the blackboard with chalk rarely if ever gives thought to the development of this humble, insignificant material which plays such an important role in the classroom. Few know that the crude chalk used in the classroom years ago was brought to this country as ballast in the old sail vessels that came from abroad. How Dr. Field of Waltham, Mass., 100 years ago, conceived the idea of powdering this crude chalk, mixing it with a binding medium and then forming it into sticks, is interestingly told in the centennial booklet issued by the American Crayon Company. Dr. Field's chalk sticks became popular at once. In the space of time, improvements in the methods of manufacture were introduced until the chalk used today is quite smooth and gritless.

Much information of a similar nature is available on a great variety of products. More, no doubt, would be forthcoming if every teacher made it a practice to express his approval to the firms who issue this type of helpful related-subjects material. A letter of commendation is welcomed by everyone and manufacturers and dealers will gladly furnish a wealth of real information about their products if they are but told how well it fills a definite demand.

Making Safety Lessons Entertaining

One of the large life-insurance companies recently originated a unique safety-teaching plan which features a film offering entertainment rather than horror, and combines fun with music, to stress the danger of reckless and careless driving. The picture called "Once Upon a Time" shows in a humorous way the road pests who make motoring dangerous. The gruesome

details of automobile accidents are absent, yet the consensus of opinion of specialists who have viewed the picture shows that this indirect method of attacking careless driving is successful in emphasizing the idea that one should not be a road hog, a back-seat driver, a speeder, or an ignorer of traffic rules in general. The film also shows that careless driving may not only result in disaster to the driver himself, but frequently also injures innocent pedestrians. The catchy music and the funny characters taken from Mother Goose, Alice in Wonderland, and the like, make the picture a source of genuine entertainment in which the moral purpose, that of showing the danger of recklessness and carelessness in driving, is never lost sight of.

Some people who rightfully look upon the safety movement as something of grave importance, may not agree that it is permissible to caricature the subject. Yet, it is well to remember that this method is just one other attempt of impressing important safety information and instilling safety practices into the habitual life of a large number of individuals whose reactions to educational efforts vary greatly.

It is true that safety education should be a vital part of present-day educational efforts. It is true, also, that the results of ignoring safety methods frequently are somber and gruesome. Yet the old-time safety teaching methods with their emphasis on ghastly detail may have set up harmful inhibitions in some students. Cloaking these lessons with humor and lightness, therefore, may probably make them more acceptable and more interesting to a larger number.

At any rate, the attempt bears scrutiny and there is no reason why this method should not be tried out in the teaching of safety in the school shop. As a matter of fact, we need not worry so much by what method needed information is presented as long as the students can more easily and profitably acquire it.

International Relationships

To many it would seem that the individual shop teacher can do but little in affecting the relationships which exist between our country and other countries with which we have business dealings. Yet, the shop teacher who inaugurated the International Drawing Exchange had that objective in view.

Early in March, 1928, Walter G. Hjerstedt, instructor of architectural and machine drawing at Roosevelt Senior High School, Chicago, Ill., conceived the idea of having his students exchange their drawings with the students of secondary schools in other nations of the world. It was his idea that this interchange might not only disclose new and better ways of teaching drawing, but that it might even develop a spirit of tolerance and of free cooperation between the different countries.

It was easy to interest his students in an undertaking so novel, but the idea was equally well received in the other countries with whom correspondence was started. In the seven years that have elapsed since this experiment was started, a large permanent exhibit of the work of student architects and engineers from a great number of foreign countries has been started in Chicago and it is continually growing. Even if this experiment does not prevent future wars, it represents a step in the right direction, creating as it does, respect for that which the school systems of the various countries are doing.

Mr. Hjerstedt is to be complimented on the success of his efforts and if he accomplishes no more than to improve and give more zest to the work which he is offering in his drafting classes, his efforts at establishing friendly international relationships are worth while.

Getting Down to Work

Much time is frequently wasted by those assigned to committee duties on endless discussion about points on which they cannot or will not agree. Practically every committee has at least one member who feels called upon to raise every kind of possible and impossible objection to anything that may be proposed. Much can be learned by these recalcitrant committee members when they consider how the members of the National Conference on Industrial Arts which was held at the U. S. Office of Education at Washington, D. C., November 19, 20, and 21, 1934, attacked the problem which was presented them for consideration.

The men who attended this conference had all been chosen because they were leaders in industrial-arts work in their particular sections of the United States. Each one of them had become successful in his particular community because of the fact that he had definite ideas on the subject and yet at Washington they were asked to combine their experiences for the purpose of preparing a report which would set forth, once and for all, the place of industrial-arts work in the school program. From the very outset, there was danger that much time might be wasted by fruitless argumentation. These men, however, decided that there should be no lost motion in their efforts, and for that reason they determined to find out on how many things they could agree, rather than spend time on the points of disagreement. By following this procedure, they discovered so much work which could be attacked at once, that there was no time for those things upon which they might and did differ.

No doubt these men will produce a report of which the country can be proud, but in their way of attacking their work, they have set an example to the teachers and supervisors of industrial arts and vocational education that may well be followed throughout the country. The points of disagreement may probably be in the minority in most subjects of discussion confronting schoolmen. It may be well, therefore, to ignore them or, if necessary, arrive at a compromise in order that more effective work may be accomplished with the students who come in ever larger numbers to the shops in which industrial-arts and vocational subjects are taught.

Common Woodworking Tools-VIII

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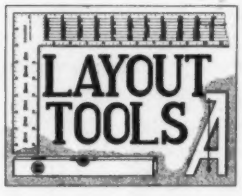
The eighth installment of the history of woodworking tools.

THE LAYOUT TOOLS

WHEN man reached that degree of advancement that included a knowledge of geometry, he developed a number of tools for laying out the geometrical forms characteristic of the homes in which civilized man lives. These laying-out tools form a convenient group for study. The changes that have been made are mainly those that have occurred in other tools — changes in materials as man developed better and better metals; improvements in form as trial found them desirable; changes in ways of manufacturing as man developed new tools, machines, and methods of working. A few changes have been made to increase the uses of the tools.



The Rule

The first measuring devices were doubtless parts of the human body, as the length of a man's foot, the width of his hand, the reach of his arm, and the like. The Hebrew cubit was the length of a man's forearm; the Greek palm, the width of a hand; the English fathom, the span of a man's outstretched arms. A good many peoples have used the length of the human foot as a unit of measure, though the units have not been very close in agreement. Our English "foot" probably came to us through the Greeks who divided it into three "palms." The Romans rejected the palm and divided the foot into twelve inches. The Saxons gave us our present standard of length which is legally the yard.

Probably these early units were not very exact as to just how long they were, and it early became desirable to standardize them. Edward II, in 1324, decreed that "three barley corns, round and dry, make 1 inch; 12 inches, 1 foot." It took 500 years before anything more exact than "three barley corns round and dry" was the standard of length among the English people. Then George IV established a certain bar of brass as being the *standard yard*. This standard yard was later destroyed by fire, but since 1834 the standard yard has been the distance between two parallel scratches on a bar of bronze and gold in Westminster. This bar is officially named Bronze I, and a copy of it, officially Bronze II, is in the archives of the United States Government at Washington. So carefully are these two metal bars preserved that, under no conditions, are they ever touched by human hands.

With units of length as indefinite as "three barley corns, round and dry," it is to be supposed that the early carpenter's rule was not a very accurate tool. Probably, like so many of the carpenter's tools, it was a tool of the workman's own making. Its accuracy would therefore depend on his skill and the accuracy of the scale from which he copied. In Moxon's book, 1678, the rule is illustrated simply as a foot-long stick. In the *Circle of Mechanical Arts*, 1813, the rule is shown brass-tipped with two 6-in. hinged arms.

The four-fold carpenter's rule shown in Figure 84A, was probably made at first in Europe and imported into this country until about 1840. By whom and when they were first manufactured in this country, the author has been unable to determine. The present Stanley Rule and Level Company had its beginning in the A. Stanley and Company that began making boxwood and ivory rules in 1850, but others had manufactured rules in the United States before that.

The zigzag rule, in Figure 84B, was first made in this country, by the Stanley Company in 1899. At first it was thought of as a novelty, but it steadily grew in favor until it has practically done away with the 3- and 4-foot folding rules.

The flexible-rigid steel tapelike rule, Figure 84C, that is now threatening the popularity of the zigzag rule, was developed several years ago by Hiram A. Feirand, of Berlin, New Hampshire. He sold it under the name of Rapid Rule. Recently the Stanley people bought his patent and are now putting out the new rule somewhat modified under the name of Push-Pull Rule. This rule, with the combined advantages of the rule and the tapeline, promises to become a permanent addition to the woodworker's tool kit.

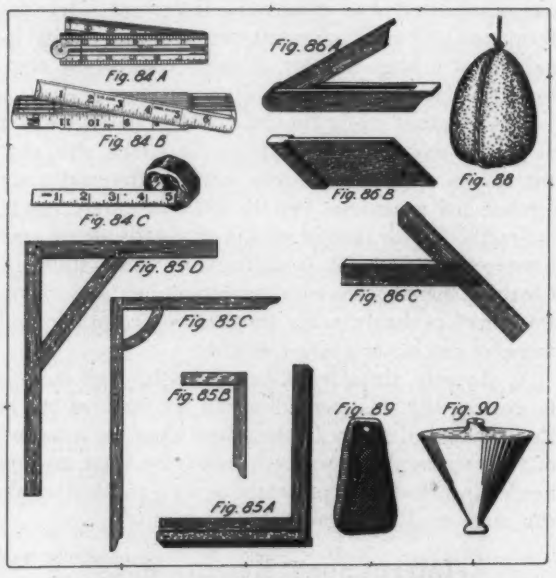


Fig. 85A. Ancient Egyptian square from XVIII Dynasty. Fig. 85B. Joiner's try-square from Moxon's Mechanek Exercises, *1693. Fig. 85C. Homemade framing squares of 18th century. Fig. 86A. An 18th century French bevel square. Fig. 86B. An 18th century French miter square. Fig. 86C. An old wooden miter square from Salem, Mass. Fig. 88. Egyptian stone plummet. Fig. 89. Greek lead plummet. Fig. 90. Italian bronze plummet*

The Square

The square is a tool of civilized man. One could not conceive of a savage, having no knowledge of mathematics, making any intelligent use of such a tool. It is, therefore, not surprising that we find the builders of the ancient pyramids to be the first users of the square. They evidently used it extensively, and made it of wood in a variety of forms, one of which is shown in Figure 85A. The builders of Jerusalem, Greece, and Rome also used the square. The latter called it the *Norma*. Throughout the Middle Ages, the square was a

tool of several building crafts and varied in form, size, and material with the requirements of the trade and the intended use. The smith, and sometimes the mason, used a metal square; the joiner and the carpenter used wooden squares, though of different sizes and forms. Workers in wood made their own squares of wood almost up to the beginning of the Factory Era in the last century. Examples of these are shown at C and D in Figure 85. The now familiar practice of marking the square with scales is apparently a recent innovation, as no such markings are found on drawings of old squares.

The first metal squares made in the United States for the use of carpenters were probably made by Silas Hawes, a blacksmith of South Shaftsbury, Vermont, about the time that the War of 1812 closed. One day he welded some old pit-saw blades together to form squares, stamped scales on them and sold them to a peddler. This traveling merchant found such a ready market for the newfangled iron squares that he kept reordering, until within a year Blacksmith Hawes found himself manager of a square factory with several assistants. Hawes patented his metal squares, developed machinery for making them, organized several new factories, and was able to retire from business in 1828 as a man of considerable wealth.

Up to about the close of the Civil War, all metal squares were graduated by hand tools. In 1865, the still existing Eagle Square Manufacturing Company, located where Hawes started making his first squares, developed a mechanical graduator that stamped on the scale far more accurately and neatly than had before been possible by hand. About ten years later, machine stamping was extended to applying some of the special markings now found on the carpenter's framing square.

The square had originally been simply a tool for testing and laying out right angles. The addition of scales to the square greatly increased the possibilities of the tool. They made it possible to use the tool to lay out miters, special angles, ends of braces, figure rafter lengths, and gave many other uses to the square. Knowledge of how to use the square came to be looked upon as a measure of a builder's craftsmanship. Many pretentious books were written explaining how to use this tool. This accentuation of the importance of the tool caused ingenious minds to devise many new markings to go on it. Even before the day of machine graduation, a Mr. Essex, then a foreman of the Eagle Square Manufacturing Company, had developed the Essex board-measure table. It is still one of the most valued markings on the framing square. The octagon scale, hundredth scale, and brace table were early and permanent developments. The rafter-framing table was the latest of the special markings. It appeared in 1907.

The recent improvements of the steel square have been the development of the take-down square, making one-piece squares without a weld at the angle, making its markings more legible, and development of rust-resisting finishes. The light aluminum square is one of the promising recent innovations.

The try-square seems never to have varied much from its present form. In that interesting old treatise on woodwork published in 1693 by Moxon, *Mechanik Exercises or Doctrine of Handy Works,* he illustrates it as shown in Figure 85B and says, "It is made of two pieces of wood, the one about an inch thick, and the other about a quarter of an inch thick. The tongue is fastened into the mortise of the handle with *glew* and wooden pins." The substitution of metal and the addition of the graduations are modern innovations.

The miter square, in the days before the graduation of the framing square, was a more important tool than now. Being generally a tool made by its owner, as were most of the woodwork tools then, it was, of course, made of wood and probably in quite a variety of forms, two of which are shown in Figure 85B and Figure C.

The bevel square or T-bevel probably never was a very important tool in the woodworker's kit, but it is not a twentieth-century invention. The wooden bevel shown at A in Figure 86, was redrawn from a French encyclopedia published in 1769. This is probably the oldest picture but the tool is probably much older than that.

There have been a good many special and combination tools put on the market in recent years that might be discussed as variations of the square. It would be interesting to discuss some of them, but one would not want to consider all of them; so it seems wise to confine this article to what we may call the standard tools. It should be realized, however, that improvements to standard tools come through the development of new, and sometimes freak, innovations. It may be reasonably expected that some of these variations will some day become parts of the standard squares, and future writers of the history of the square will have to recount developments of some of them.

Compasses and Dividers

Compasses and dividers were apparently unknown to the ancient Egyptian builders, as no indication of them is found in their writings, or pictures, or in their construction work, until those later days when it can be assumed that they got their inspiration from their European contemporaries. The Grecians knew these tools, but had little use for them. They knew well the superior beauty of free-hand curves and used them preferably. The Romans, however, used the circle and arc extensively and made continual use of dividers and compasses. They made these instruments in both bronze and iron, and with both straight and curved legs. Though the Romans knew how to make and use screws with nuts for fastening parts together, they did not use such modern devices for fastening their compass joints. Instead, they used the very ingenious and effective mortised pin-and-key joint shown in Figure 87. It was simple and yet permitted easy adjustment of the pressure between the two legs.

Fig. 87. The compasses of the Romans were tightened with a tapered pin

Not until recent times has there been provision made for marking the arc in any other way than by scratching it with a sharp point. Only in comparatively recent days were compasses provided with means for holding pencil or graphite. Older compasses had a clamping arrangement for holding pieces of lead, charcoal, soapstone, or other marking substance.

Plumb-and-Level

The pyramids and temples of Egypt could hardly have been built without some instrument by which to plumb and level the work. The Egyptian artisans developed simple but quite efficient tools for this purpose and used them so accurately that, even today, we admire the precision of their work. The Greeks and Romans, and even many centuries of the civilization of Western Europe, did little more than polish up these inventions of the Egyptian builders. Not until the time of the Romans, did anyone seriously suggest a means of determining the vertical or horizontal by any other means than by a plumb line, and not until recent times did anyone develop a practical plumb-and-level without it.

With the Egyptians, the plummet was simply a suitably sized stone, grooved so it could be held in a loop in the end of the line, as shown in Figure 88. The Greeks made their plummet of lead and put a convenient hole through it for tying it to the line. See Figure 89. Incidentally, they gave

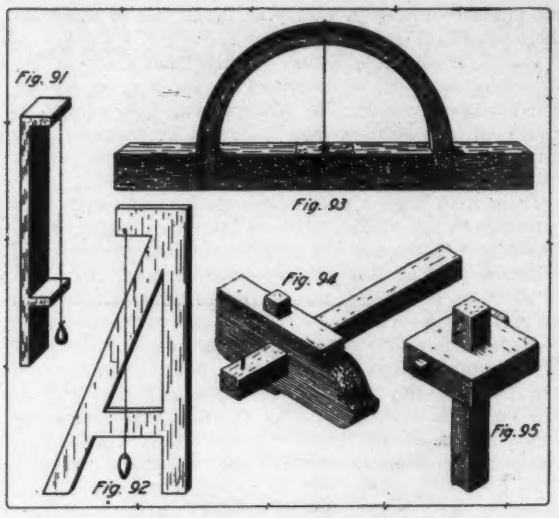


Fig. 91. Egyptian plumb. Fig. 92. Greek plumb and level. Fig. 93. The plummet-type level in use before the spirit level came into use. Fig. 94. An 18th century marking gauge from France that had no thumbscrew. Fig. 95. An 18th century French mortise gauge

the tool its name, for the word *plumb* comes from a Greek word meaning lead. The Romans changed the material to bronze and gave it a toplike form, shown in Figure 90, so the pointed lower end could be used as an indicator point. Since bronze is soft enough to batter up in use, the sharp point to the plumb-bob of today was not used until the cast-iron plummet came into general use.

Since the plummet cannot be used with the line against the face of a wall, the Egyptian builders used an instrument while plumbing, like that shown in Figure 91. They tested level with an A-shaped tool that had a plummet and line hanging from the top. A mark on the horizontal bar indicated where the line should cross it when the two feet of the tool were level with each other. The Greeks combined the plumb with the level by making vertical one leg of the Egyptian level as shown in Figure 92. It made an efficient and practical combination tool — a combination we still retain in our modern plumb-and-level, though we use other means than the plumb line in determining the direction of gravity. The form of the instrument has changed from time to time and to meet particular uses, the principal change being to substitute the horizontal beam, as shown in Figure 93, for the two feet of the A in the ancient form.

A plumb line cannot be used accurately in a wind, otherwise we should probably still be using a plummet-type level. The ancients recognized this defect, and a Roman writer explained how a shallow trough filled with water could be used in a wind in determining the level. In 1666 a Frenchman, Thevenove, invented the spirit level, but it was a hundred years before the little bent tube of alcohol seriously challenged the more than 2000-year-old plummet on the level. Some writers say that the spirit level could not be made accurately at first, but a more important reason was probably that the day of each carpenter making his own tools had not passed. A carpenter could make a plummet for his level but he could not make a spirit-filled glass tube. The spirit level is a product of the Factory Era.

The Marking Gauge

The marking gauge is such a simple tool that it seems it could never have existed much simpler than it is now. However, it is only recently that it has had the thumbscrew we now use to tighten the head in place on the beam. Moxon (1693) illustrates it with no tightening device at all and explains in the text that, if the beam becomes too loose in the mortise to stay in place, the tool can still be used by crowding a feather wedge in beside the beam. In Figure 94 is shown a gauge illustrated in an eighteenth-century French book, which has a very serviceable tightening wedge that is apparently as effective and convenient as our modern screw. This same book illustrates a simple mortise gauge that had positive settings for eight mortise widths. See Figure 95. Even in that day when the mortise was used so much, such a gauge must have had all the range ordinarily needed.

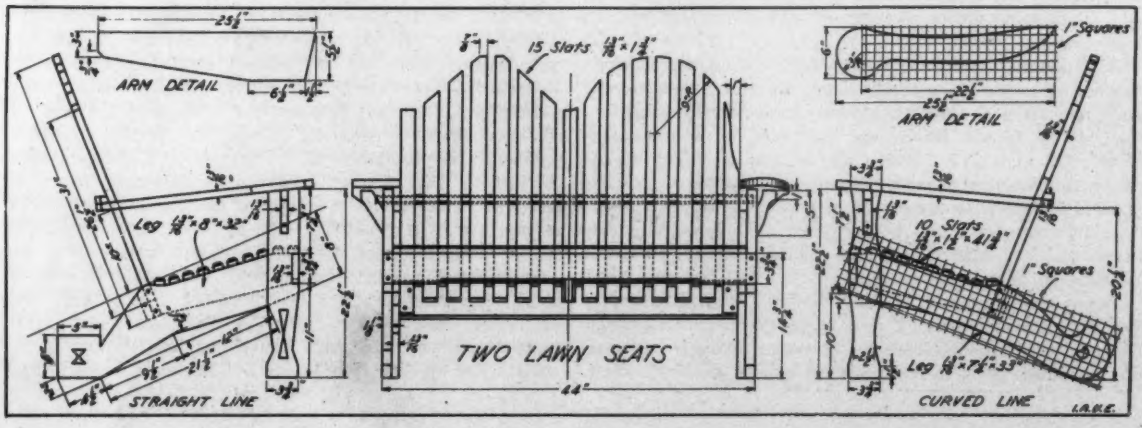
Problems and Projects

TWO LAWN SEATS

H. H. Robinson, Principal, Senior High School, Augusta, Kansas

It is believed that the two designs for lawn seats described in this article have some advantages over the average seat ordinarily made. They are comfortable, substantial, and of practical construction. The construction does not involve any difficult problems, hence it is within the ability of almost any boy in the school shop.

The frame should be fastened together throughout with screws. The seat and back slats may be fastened with brads. It is, however, important that the two outside back slats



extend down to the bottom of the back rail and that these two slats be fastened to both the back rail and the slanting leg with screws. If this is done, a good rigid corner construction will result that does not depend upon screws driven into end grain as would be the case if this were not done. The center back slat should be notched over the center seat rail. Since it is important that the angle on the front end of the slanting legs be correct, it is better to lay that angle out with a framing square than to try to get it from the leg detail. By holding the figures 10 and 23 of the framing square along the straight edge of the leg board before the curves are cut out, the correct angle will be secured.

Since the long horizontal piece that supports the back slats is not heavy, it should be made of some strong wood. Almost any inexpensive wood that works easily will lend itself to the construction of the remainder of the seat.

Bill of Material

2 Pc.	1⅛ x 3¾ x 22½	Legs
2 Pc.	13/16 x 8 x 33	Legs
1 Pc.	13/16 x 3¾ x 44	Front Rail
1 Pc.	13/16 x 4 x 40¼	Back Rail
1 Pc.	13/16 x 1½ x 44	Back Support
1 Pc.	13/16 x 4 x 18	Seat Rail
2 Pc.	13/16 x 6 x 25½	Arms
2 Pc.	13/16 x 2¼ x 5	Arm Brackets
10 Pc.	¾ x 1½ x 42½	Seat Slats
15 Pc.	¾ x 1¾ x 31	Back Slats

SMALL PLANT STANDS

H. M. Andersen, Cicero, Illinois

The simple plant stands shown and described herewith provide a wide field of expression for the industrial-arts student. The stand on the left is constructed of ¼-in. square material. The ends of the two pieces which are used for uprights are forged to a taper and scrolled over a template. The pots are supported by metal trays 4 in. in diameter. The base also is of ¼-in. square stock, formed into a circle with a diameter equal to the center-to-center distance between the scrolls of the uprights. All parts are oxyacetylene welded.

The upright of the stand shown at the right is made of ¼ by ⅜-in. stock. The end for the base is split for a distance of 5 in. The other end is tapered and scrolled, the top scroll being offset so that the center line of the upright passes through the center of the scroll. The circular supports for the pots are welded to the upright, as is also the base. Pot supports and base also are made of ¼ by ⅜-in. material.

The stands, when finished, may be polished and coated with warm wax.

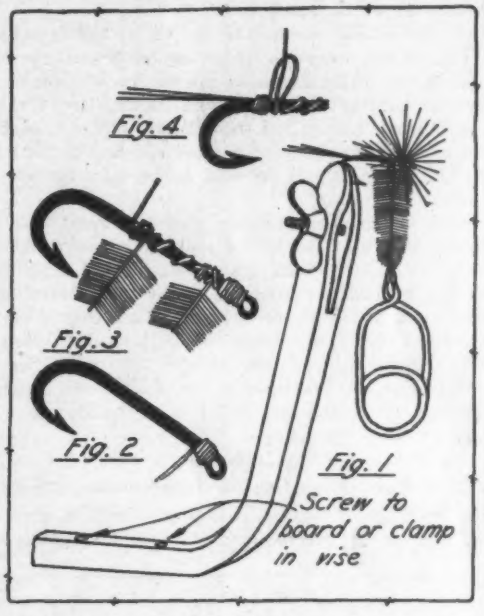
FLY TYING AS A HOBBY

L. E. Kumerow, High School, Janesville, Wisconsin

With more and more time for leisure through the shorter working day and unemployment, the problem of interesting boys in hobbies is a vital one. One activity which appeals to a large group of boys, and which usually becomes a life interest is the activity of fly tying.

A fly-tying hobby is one that can be practiced by any boy who has the slightest interest in fishing. In fact, the writer has boys in his classes who are interested in tying flies, who have never gone fishing. Boys accustomed to fish with live bait will quickly change over to flies of their own make when they know that nearly all forms of fish can be taken in a sportsmanlike manner with such lures. Surely a boy will have an extra thrill when he catches fish on flies that he has designed and tied.

Many factors will enter into fly making. A knowledge of fish and their habits is required. Flies must be designed to



attract fish under the natural conditions found in different localities. The species of fish and the kind of waters to be fished, also must be considered.

Of the tools needed, probably the most important is a small vise for holding the hook so that both hands may be used for the tying. Such a vise may be made quickly by slitting a small metal bar at one end with a hack saw, grinding the jaw to shape, and using a small bolt and wing nut through this slotted end for the pressure device. A vise of this kind is shown in Figure 1. Hackle tweezers can be made from old car valve springs if nothing else is available. Any small clamp that will tightly hold the tip of a small feather when it is snapped on will do.

Materials of which to build the flies will come from a variety of sources. There will be needed assorted hooks, hackles from the saddles and necks of domestic poultry cocks, yarn, buck tails, squirrel tails, tinsel, chenille, beeswax, clear lacquer, and 00 thread.

In starting to tie flies, one can gain information from various sources. Outdoor magazines frequently have articles on the subject; old flies may be torn apart and inspected, and tackle companies have books and aids.

In addition to fly tying, rod making can be tried, and group competition in fly and bait casting may be instituted. It is through such supervised activities that real sportsmen and conservationists are developed.

As a starter, try tying a simple fly. For this purpose try tying a plain hackle, which, by the way, is as effective to use as it is simple to make.

First, place a No. 12 short-shank hook horizontally in the vise, as shown in Figure 1. The jaws of the vise need grip only a small part of the hook close to the barb.

Now take about 12 in. of 00 thread, wax it well with beeswax. and then wrap a few turns behind the eye of the hook to close it, as shown in Figure 2. These windings will keep

the leader from being pulled into the slight eye opening and will prevent wear and breakage. The loose end of the thread can be held in one hand while the hackle is picked up with the other.

Select a couple of stiff hackles, strip off the soft fiber end, and bind to the shank of the hook with the glossy side to the eye, as shown in Figure 3.

Continue winding the thread to a point on the shank just above the barb. At this point, tie in several squirrel hairs or several feather fibers for a tail. Tie off with a couple of half hitches, as shown in Figure 4.

Pinch the hackle tweezers to the tip of the first hackle (see Fig. 1) and wrap the hackle tightly around the hook. Tie off the end with a couple of half hitches with the thread. Repeat the process with the second hackle. Tie off the tip neatly with half hitches and trim off the ends of thread and hackle with a sharp knife or a small scissors. If the hackle is too thin or too thick, an extra hackle may be added or one may be left out.

To put on the final touches, coat the front and back wrapping with white shellac to seal in the wax, and later touch up with spar varnish to give long life and durability.

After a few tries, a neat fly can be tied. Make up an assortment of flies from the different natural-colored hackles. The natural colors will bring the best results. When the fingers become a little more skillful, try duplicating flies from catalogue cuts and make a few of your own design.

The fish will be the best critics of your ability as a lure maker.

CANOE

E. A. Lair, High School, Jacksonville, Illinois

The building of a canoe creates and holds a great deal of interest for the average boy. It is not a difficult project and can be accomplished in the tenth or eleventh grades, by students of average ability.

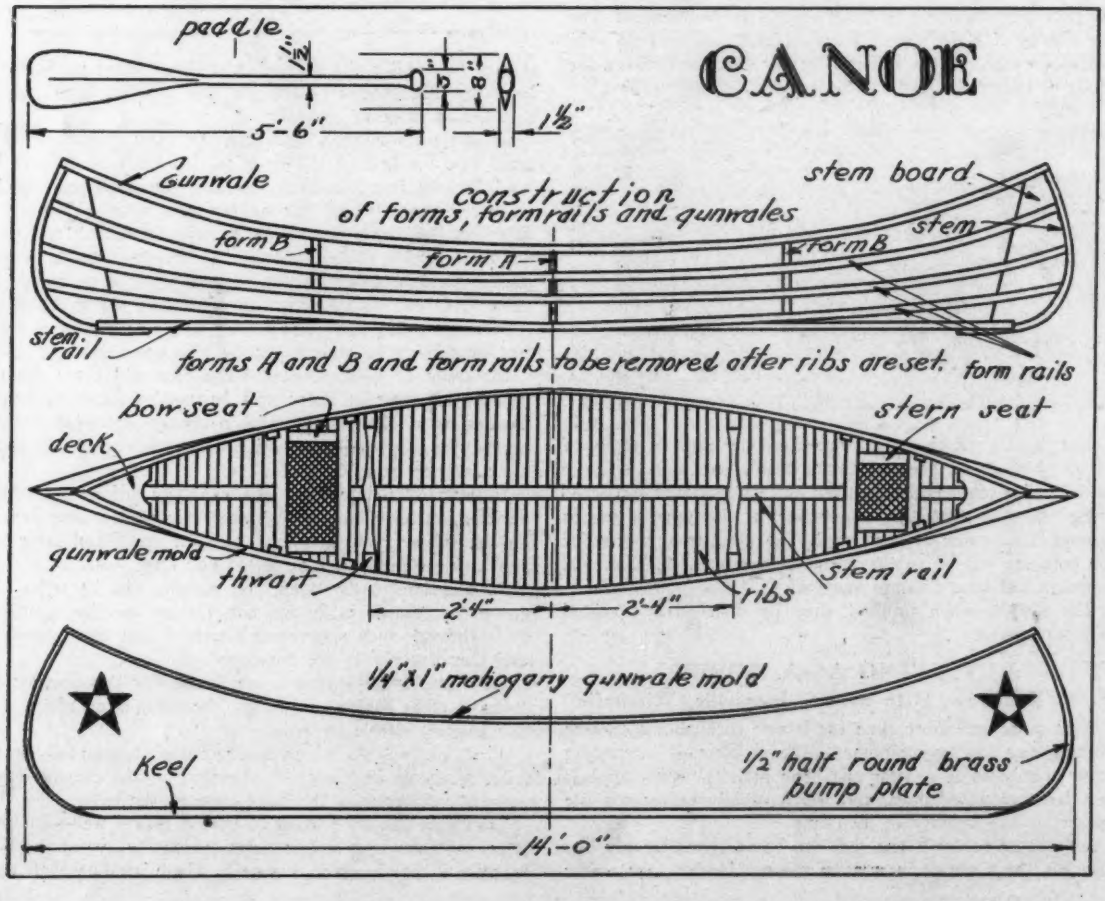
It is necessary, however, that accuracy and neatness be employed to the fullest extent in order to secure the most desirable finished product.

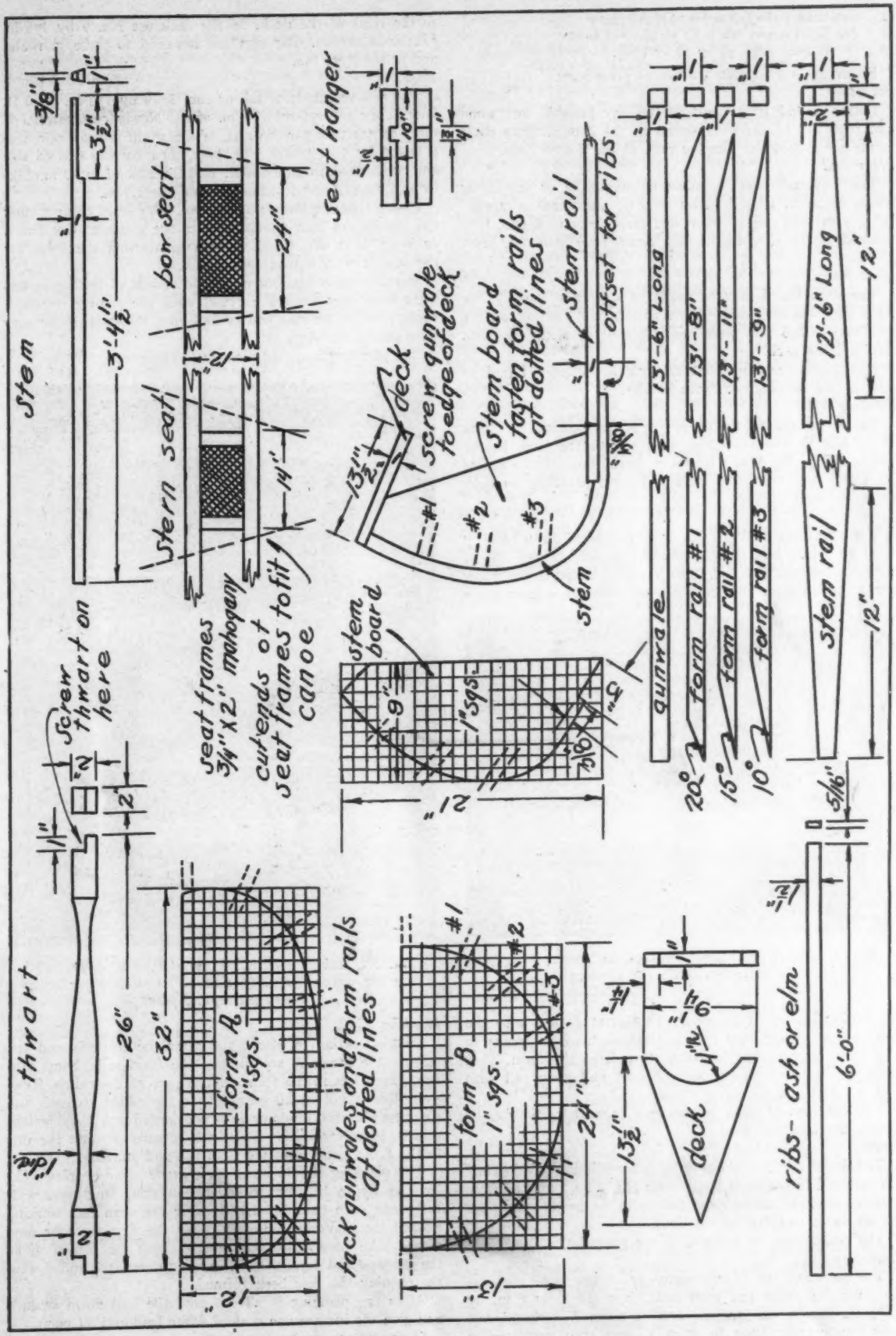
Several of the canoes described in this article have been built in our department very successfully.

They weigh approximately 90 to 95 pounds each, and the average cost of materials will be about $20.

Bill of Material

No. Required	*Name*	*Material*	*Size*
1	Forms A	Pine	12 x 32 in.
2	Forms B	Pine	13 x 24 in.
1	Stem rail	Mahogany	1 x 2 in. x 12½ ft.
2	Stems	Ash	1 x 1 x 1 x 40½ in.
2	Gunwales	Mahogany	1 x 1 in. x 13½ ft.
6	Forming rails	Cypress	1 x 1½ in. x 16 ft.
60	Ribs	Elm	5/16 x 1½ in. x 6 ft.
60	Board feet planking	Cypress	5/32 x 2 in. x 16 ft.
2	Gunwale molds	Mahogany	¼ x 1 in. x 16 ft.
2	Stem boards	Pine	¾ x 9 x 20 in.
2	Decks	Mahogany	1 x 9¼ in. x 13½ ft.
1	Keel	Cypress	¾ x 1¾ in. x 13 ft.
1	Seat frames	Mahogany	¾ x 2 in. x 14 ft.
1	Canvas		No. 18-oz., 60 in. x 14½ ft.
1 lb.	Cane		Medium
2	Thwarts	Mahogany	2 x 2 in. x 26 ft.
12½ lbs.	Lead paste		
1 qt.	Turpentine		
1 qt.	Spar varnish		
1 qt.	Natural-color filler		
2	Bump plates, brass ½ x 36 in., half round		
1 lb.	Brass nails No. 19 by 5/16 in.		
½ lb.	Copper tacks No. 4, flat cut		
14 doz.	Brass screws, No. 4 by ¾-in. f.h.		
½ doz.	Brass screws, No. 9 by 2-in., f.h.		




Stem
3/8"
3'-4½"
Bow seat
Stern seat
Seat frames 3/4" x 2" mahogany
Cut ends of seat frames to fit canoe
Seat hanger
Deck screw gunwale to edge of deck
Stem board fasten form rails at dotted lines
Stem rail
offset for ribs.
Stem
Gunwale 13'-6" Long
Form rail #1 13'-8"
Form rail #2 13'- 11"
Form rail #3 13'- 3"
20°
15°
10°
Stem rail 12'-6" Long
12"
Screw thwart on here
Thwart
26"
32"
Form A 1" sqs.
Tack gunwales and form rails at dotted lines
Stem board
9"
1" sqs.
12"
Form B 1" sqs.
#1
#2
#3
24"
13"
Deck
Ribs- ash or elm
6'-0"

2 doz. Brass screws, No. 9 by 1½-in. f.h.
3 doz. Brass screws No. 8 by ¾-in., oval head
8 Hanger strips, ½ by ¾ by 10 in.

Following is a suggested order of procedure:

Forms

Forms A and B are laid out on any suitable soft wood and then cut to shape as shown in the details. Onto these forms are tacked the forming rails at the dotted lines.

Stem Rail

The stem rail may be made of mahogany or any other strong material, 1 by 2 in. by 12½ ft. This piece is tapered back from each end 12 in. It is 1 in. wide at each end. It is screwed to the stem board with No. 9 by 1½-in. f.h. brass screws.

Stem Board

The stem board may be made of any light wood ¾ in. thick. Lay out according to the pattern and cut out on the band saw. Onto this piece are fastened the stem, the stem rail, and the deck.

This piece simplifies that construction usually found so difficult for the student canoe builder.

Forming Rails

The forming rails are of ¾ by ¾-in. cypress, cut from 16-ft. lengths and tacked at each end to the stem boards and to the forms A and B at the dotted lines. These are to form the ribs over. The rails will bend naturally to their places without boiling.

Stem

The stems are made of ash or elm, dressed down to 1 by 1 by 40½ in. These pieces should be straight-grained and of carefully selected material. They must be boiled in hot water for about an hour and then clamped around a form made

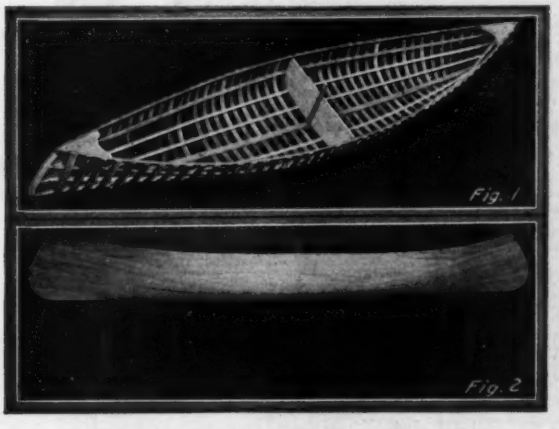


Fig. 1. The frame with form A in place. Fig. 2. Planking on, ready for sanding

by nailing blocks to the floor. This form should have the same shape as the stem board. Allow each of the stems to dry thoroughly before removing them from the form. They must be fastened to the stem boards and stem rail with No. 9 by 1½-in. f.h. brass screws.

Any long pan or metal trough may be used for boiling the stems, and later the ribs.

Deck

The decks are of mahogany or other suitable wood. They are fastened to the stem board with No. 9 by 2-in. f.h. brass screws. Countersink the holes and cover the heads with plugs of the same material as the deck.

The decks also are fastened to the gunwales.

Gunwales

The gunwales are of mahogany or of the same material used for the decks and stem rail. They are 1 by 1 in. by 13½ ft. Fasten the gunwale first to form A securely, but only temporarily; then to form B, and then permanently to the sides of the deck. At the deck use No. 9 by 1½-in. f.h. brass screws. The ribs are fastened to these gunwales and to the stem rail.

Ribs

The ribs are made of ash or elm, 5/16 by 1½ in. by 6 ft. long. They are spaced 1½ in. apart. Newly cut material is most satisfactory for the ribs. If a sawmill is near, purchase a few 2 by 4-in. pieces 6 ft. long, then cut the ribs to size and dress down to dimensions. Boil the ribs 45 to 60 minutes in water and bend to shape around the canoe.

Fasten them to the stem rail first, then bend them around the canoe, and then attach them to the gunwale. Use No. 4 or 5 by ¾ in. f.h. brass screws. Countersink the holes for the screws with a rose countersink.

Start fastening the ribs on at the middle of the canoe and work each way toward the end until the stem is reached. From here on the ribs will be half ribs, fastened to the gunwale and to the stem rail.

The planking is nailed directly to the ribs.

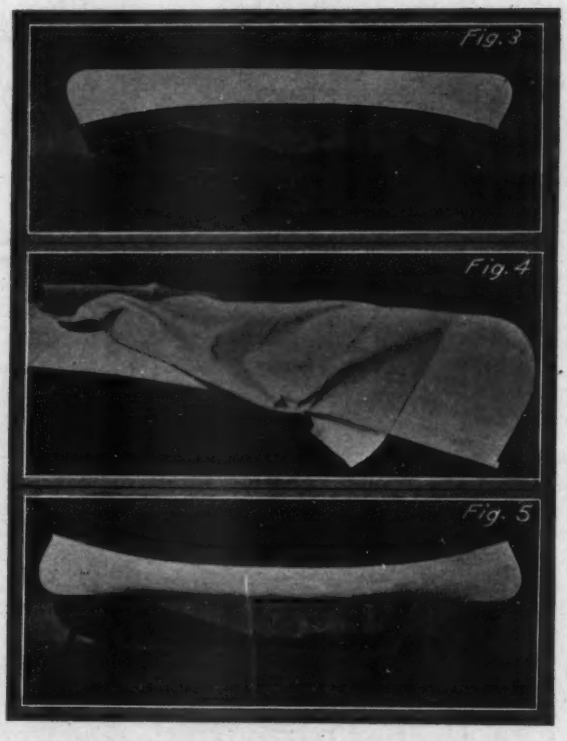


Fig. 3. Planking sanded, and painted. Fig. 4. Stretching the canvas. Fig. 5. Canvas on. Ready for keel, bump plates, and paint

Planking

Before starting to plank, and after the ribs are well set, remove the forms A and B, and the form rails. Some students have left in the form rails as part of the canoe. However, this is not at all essential, as the added strength and rigidness obtained by doing so is not needed and added weight results. However, if this is desired, be sure to screw the ribs to these the same as to the stem rail and gunwale.

The planking should be of first grade clear cypress 5/32 by 2 in. by 16 ft. Start nailing the planking lengthwise with the canoe onto the ribs directly over the stem rail, working toward the gunwale. However, after the first eight or nine pieces have been nailed on, start nailing the pieces on at the gunwale and parallel to it, working downward and closing the opening that has been formed.

After the planking is all on, sand the hull down smooth and give the surface one coat of white lead and oil paint.

Over this the canvas is placed.

Canvas

The canvas is laid on in one piece. Use a piece of 18 oz., 60 in. wide, and 14½ ft. long. Place the canvas evenly over the hull and tack down along the center over the stem rail from one end to the other. Then stretch tightly over the hull and start tacking on to the top edge of gunwale, working from the middle of the canoe toward the ends.

Care must be taken in stretching to remove all wrinkles. Trim the canvas at the ends to fit the stem and lap over and tack to the stem, using paste lead as a sealer. Trim off all other surplus canvas.

Keel

The keel is ¾ by 1¾ in. by 13-ft. cypress, slanted off at each end to receive the bump plate. It is fastened with No. 10 by 2-in. f.h. brass screws through the keel into the stem rail. Countersink the holes and plug up. Before fastening the keel, apply a thin coat of paste lead to the underside of it. This seals the joint.

Bump Plates

The bump plates are of ½ by 36-in. half-round brass, fastened to the stem over the canvas. These plates start directly under the point of the deck and end on the keel. Use No. 6 by ¾-in. oval head brass screws.

Seats

The frames are made of ¾ by 2-in. mahogany, or material same as deck, gunwales, etc. The frames are caned, and are hung from the gunwale by hanger strips ½ by ¾ by 10 in. Screw one end of the hanger to the gunwale and the other end to the rib. The frames are set in notches cut in the hanger strip. The bow seat is set approximately 4 in. lower than the gunwale, and the stern seat approximately 5 in. lower.

Thwarts

The thwarts are made of the same material as the decks, seats, etc. They are turned to sizes given in details. They are screwed to the underside of gunwales with No. 9 by 1½-in. f.h. brass screws.

Gunwale Molding

The gunwale molding is ¼ by 1 in. by 14-ft. mahogany. Make 2 pieces. These are screwed, one on top of each gunwale, with No. 8 by ¾-in. oval head brass screws. These pieces finish the top edge of the gunwales and should be brought together at the ends over the deck, and mitered.

Tread

The use of a tread is optional. However, if one is desired, it can be made of ¼ by ¾ in. by 12-in. strips nailed across two pieces ¾ by ¾ by 9 ft. in ladder fashion, about ½ in. apart. This is placed lengthwise in the bottom of the canoe to walk on.

Finish — Inside and Trim

The inside of the canoe and all trim will look very beautiful finished natural. Sand carefully and clean thoroughly, and apply one coat of natural filler. Rub down and finish with three coats of good spar varnish.

Finish — Canvas

To finish the canvas, rub in by hand a thin coat of pure white-lead paste thinned with turpentine, until the fabric is filled and smooth. Let this dry thoroughly and sand down smooth with No. 2/0 sandpaper. After this apply two coats of paint of the following formula:

White-lead paste.....	8 pounds
Pure turpentine.....	1½ pints
Spar varnish	1 pint
Dryer liquid	2 gills
Tint as desired	

Rub each coat down carefully and finish up with one coat of good spar varnish.

Paddles

Paddles may be made of fir or spruce. The size of these may vary according to the maker's desire. Finish natural with spar varnish.

THE FLAT BOW

W. Ben Hunt, Handicraft Instructor, Boy Scout Troop 98, Hales Corners, Wisconsin

If you have never watched an archery meet or tournament, you should do so before attempting to make archery equipment. To stand back of the shooting line and watch the action of the different styles of bows is extremely worth while. One archer seemingly will aim to shoot away over the target, but his arrow falls short of it, while next to him will be one who uses an almost point-blank aim. You will see English bows, flat bows, recurved bows, bows backed with fiber, bows backed with rawhide, and some without any backing, and you will wonder which is the best one of the lot. Yet, each archer likes his particular bow because he is accustomed to it.

There is much information available on the making of the English long bow. For that reason the description in this article will be confined to the different kinds of flat bows. Some call them Indian bows, but no Indian ever made as nice a shooting bow as the modern flat bow. The Indian bows usually are rather crude affairs, which bend as much at the handle as at the ends. They were hunting bows and were not designed for target shooting at 100 yards.

The Flat Bow

When making a bow, it is well to make it of a real bow wood. Yew and Osage orange probably are a little beyond the range of the average pocketbook. Lemonwood is excellent, and hickory makes a good serviceable bow, but it is not as fast as the others mentioned. Therefore, if you cannot get lemonwood, use hickory, and if you make it along the lines of the modern flat bow, you will get much pleasure out of it. Get white or second-growth hickory with the end grain running as shown in Figure 1. If lemonwood is used, the end grain does not matter so much.

Fig. 1

It is easiest to make a bow out of lemonwood. The usual staves are 1 by 1 in. or 1⅛ by 1⅛ in. by 6 ft. For a flat bow, however, it is best to get a stave about 1¼ in. wide by ½ in. thick, and 6 ft. long. Plane this smooth and then sight along the flat side to see how straight the piece is. Quite frequently the staves are slightly warped. Draw a line down the center, as shown in Figure 2, in order to get the most out of the stave.

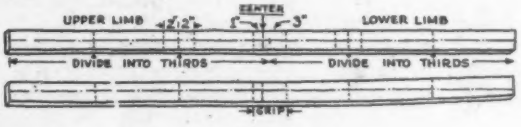


Fig. 2

If the ends are checked, cut them off. A bow of this type may be 5 ft. 4 in. long if made of hickory, and from 5 ft. 4 in. to 5 ft. 8 in. if made of lemonwood. Measure off 1 in. one way and 3 in. the other way from the center of the stave. This is for the grip or handle. Then measuring from the center of the handle, divide each limb into thirds, and then measure off 2 in. from each side of the nearest mark to the handle. Next mark off the grip, as shown.

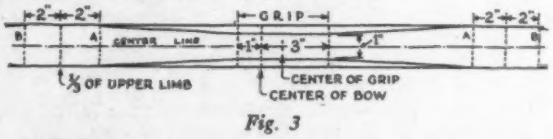


Fig. 3

The grip should be at least 1 in. wide, and for a man's hand a little wider, to suit. Draw two parallel lines the length of the grip, and then connect the ends of these lines to the ends of the lines marked A, in Figure 3. Be sure that the lines A are equidistant from the center of the grip. From

B, Figure 3, draw lines to points located ⅛ in. from each side of the center line at the ends. The exaggerated sketch in Figure 4 shows how the layout should appear.

Fig. 4

Now, with a plane or spokeshave, work down the places marked A-B, to form a graceful curve. This will give each limb a long leaf shape, as shown in Figure 5.

Fig. 5

A piece of walnut or mahogany may be used for the handle, but any hard wood will do. The piece used should be as wide as the grip, about ½ in. thick and 8 in. long. The good mechanic may glue this piece of wood with its center to the center of the belly side of the grip on the bow, and trim it down later. It may be shaped, however, as shown in Figure 6 before gluing, rounding it and the back to suit the individual grip.

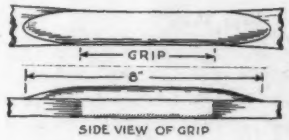


Fig. 6

Fig. 7

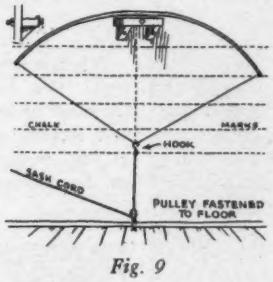


Fig. 9

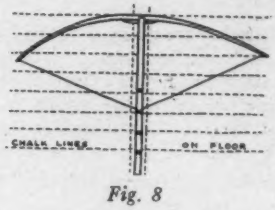


Fig. 8

The final shaping of the bow now begins, but before it is started, a rig for tillering the bow must be made. *Tillering* means bending the bow while in the process of making, to determine whether or not it is bending properly. The simplest method is with a tillering stick fashioned from a piece of wood ⅞ by 2 by 24 in. long and shaped as shown in Figure 7. In tillering, the center of the handle of the bow must be placed into the hollowed end of the stick shown in Figure 7, and the string pulled into the notches. See Figure 8.

Chalk lines are drawn on the floor as indicated in Figure 8, and when the tillered bow is laid down as shown, the irregularities of the bow are readily seen.

Another and better way is to fasten the tillering jig, shown in Figure 9, to the wall.

This jig is better than the tillering stick if more bows are to be made. It takes but a minute to lay the bow on the support, hook on the string and pull — a little way at first, and as far as one wishes after the bow gets worked down more. Lines are drawn on the wall for gauging the curve.

The bow must be trimmed down carefully with a sharp spokeshave until the sections shown in Figure 6A have been obtained. The back should have a slight arc, while the belly is rounded more. Now file the nocks. This is done with a small rat-tail file, first rounding off the ends of the bow. Do not run the nock around the back, as this weakens the bow at that point. Next get a strong piece of cord about ⅛ in. thick (no thicker) and loop the ends over the nocks so as to have about 5 or 6 in. clearance at the grip. The proper bracing of the bow will be taken up later. Put the bow on whichever tillering arrangement has been made, and pull to 12 in. This will give a first idea of how strong the bow is.

Fig. 6A

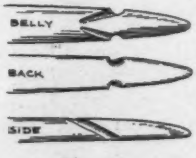


Fig. 10

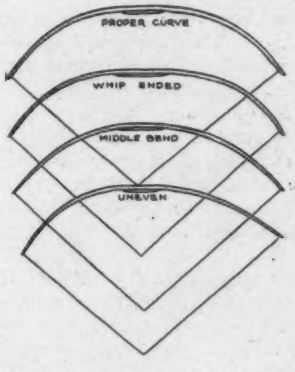


Fig. 11

Before going any further, it may be well to say a few words about the pull of a bow. For the average boy, a pull of from 25 to 35 pounds at the full draw (to the cheek) is ample. For a man it should be 40 to 50 pounds. A spring fish scale hooked on the wall tillering jig will give you this poundage. Too strong a bow is hard to handle and takes the joy out of archery. After the muscles become accustomed to this form of exercise, one can always make a stronger bow. But it is well to start out with a light bow. It will be easier on the fingers, too.

If the bow is too strong, start scraping off at the belly. The bow should have an even curve starting at about 6 in. from each side of the center. If the bow bends only at the ends, it is said to be whip ended, and if it bends too much in the middle, the bow will kick or jar. See Figure 11. If one end bends more than the other, shave off a little from the stiffer limb. For scraping, use glass, a cabinet scraper, or a piece of an old power hack-saw blade about 1 in. wide, from which the teeth have been ground off. These hack-saw scrapers cannot be filed. Be careful not to take off too much at a time while scraping, and put the bow on the tiller frequently until the proper curve has been secured. This procedure requires patience. Try pulling the bow as in shooting to see how it feels and how it fits the hand. Do not try to see how far it can be pulled at first. Take the cord off the bow for a day or two, then tiller the bow again to see if one side or the other has let down. If one limb pulls to one side, scrape off the convex side to bring it back into line. Weakening one part makes another part proportionately stronger. The only way to strengthen a bow that has become too weak is by shortening it. But this sometimes also shortens the pull. A bow 5½ to 6 ft. long will take a 28-in. arrow. Shorter bows will require proportionately shorter arrows. An average man pulls a 28-in. arrow to the pile or ferrule.

After the bow seems to have the correct pull and weight, take it out and shoot with it for a while before finishing it. The grip, however, should first be wrapped with braided fishline, or leather or plush may be glued on. To wrap it, use trolling line, and after the grip is nicely wrapped and the ends properly concealed, soak it well with shellac or lacquer and set it away to dry. Figure 12 shows how a neatly wrapped grip should look. As said before, use the bow for a while

and watch for any weakening. If one limb shows weakening, shave a little more off the other one.

Fig. 12

When the bow has demonstrated its fitness, sand it down carefully and apply a coat of shellac. When dry, rub it down with 2/0 steel wool and give it a coat of spar varnish or clear lacquer. Rub it down again very lightly with 2/0 steel wool.

It will be noticed that the bow will follow the string somewhat, that is, it will take a slight curve after the bow is unstrung. This is not disturbing, however, as this slight set will not increase. One should never try to overcome it by bending the bow the other way.

To string or brace a bow properly, the bowstring should be a fistmele from the bow, as shown in Figure 13.

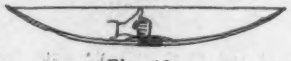
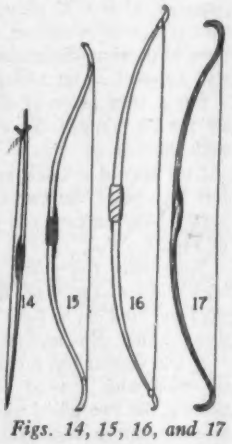


Fig. 13

Keep the bow where it will not dry out and also where it is not too moist. Always hang it on a wooden peg, as shown in Figure 14. Do not hang it on a nail, as that might cause a rust spot.

The Recurved Bow

It seems everyone admires a recurved bow. There is something fascinating about this type of bow, which is shown in Figure 15. The old English long bows were frequently equipped with horn tips designed to give the bow the appearance of a recurved bow. Besides beauty of line, the recurved bow usually has a better cast. This type of bow makes a fine hunting bow, though it is not essentially a target bow.



Figs. 14, 15, 16, and 17

To make a recurved bow like the one shown in Figures 15 and 17, requires steaming. Some bow woods can be steamed and bent more readily than others. Oregon yew, Osage orange, and hickory are best for recurving, while with lemonwood only a slight curve can be put into the ends. If, then, the bowyer is fortunate enough to have a stave of yew, Osage orange, or hickory, the steaming will be easy. With lemonwood he will have to steam the ends longer in order to get them soft enough for bending. If a number of bows are to be steamed, it is advisable to make a steaming tank of a wash boiler as

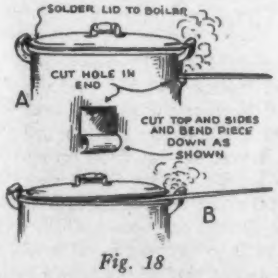


Fig. 18

shown at A in Figure 18. If only one or two bows are to be recurved, a wash boiler may be used as shown at B in Figure 18. Stick the bow ends into the boiler at one end, fit the cover in at the other end, and let it rest on the bow or bows, as shown in Figure 18 at B. Then throw an old gunny sack or piece of soft carpet over the cover and tuck it around the part of the bow which projects. Do not, however, tuck it in too tightly, or mother may need a new boiler and her boy may need a hospital bed.

The string grooves in the ends of a recurved bow must extend as far from the nock as the string touches the bow. This means also that the end should be a little thicker to compensate for the wood taken out for these grooves. Figure

Fig. 19

19 shows how these grooves are to be cut, but this must not be done until after the ends are steamed. Figure 20 shows another way in which these grooves and nocks may be cut, but this calls for a bit of careful whittling.

Another thing to remember when making a recurved bow is that the handle is not to be glued on until after the ends have been steamed. It is well also to leave enough wood on the ends to allow for some cutting down. Before beginning

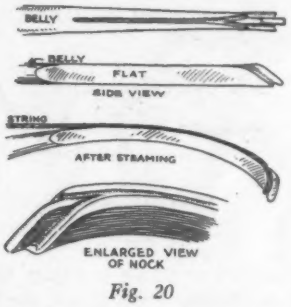


Fig. 20

the steaming, the bending form shown in Figure 21 must be made. A piece of 2-in. plank will be required for this. After cutting the end of the plank to the radius shown, fasten a loop of band iron, as shown at A in Figure 21, to the plank with a couple of stove bolts. This loop should have enough opening to hold the end of the bow.

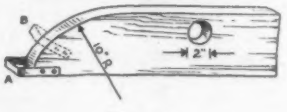


Fig. 21

To prevent the bow end from splitting while it is being bent, place a piece of strap iron 1 or 1½ in. wide by 1/16 in. thick and 12 in. long over it as shown in Figure 22. For lemonwood, the loop should be placed as at B, in Figure 21,

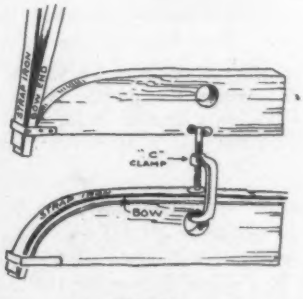


Fig. 22

and the lemonwood should be steamed for at least an hour. Next put about 2 in. of water in the boiler, and put one end

of the bow in. Yew, osage, or hickory require from 30 to 45 minutes of actual steaming.

Get the form ready and have the clamp properly set. If clamps are not available, use rope to tie the bow to the form. After the end has been properly steamed, put it into the loop, place the piece of iron over it, and with an even pressure bend it to the form as shown in Figure 22. The bending should be done smoothly, without haste, but there is no time to waste or the wood will cool off and the steaming will have to be done all over again — or probably it will be necessary to make a new bow.

If rope is used, wrap it around the whole plank.

Allow the bow to remain on the form for four hours or longer. Steam and bend the other end in the same way. Then glue the handle in place. The bow should then be hung up somewhere to dry for about a week to be sure all the moisture is out of the ends.

The bow is then ready for the nocks which should be carefully cut or filed with a rat-tail file and the rest of the end worked down to shape. Then file the string groove and the bow is ready for tillering and working down to a proper curve. It is a bit harder to string a recurved bow than a straight bow, but with a little practice the knack will be acquired. The beginner should be careful not to get his fingers under the string.

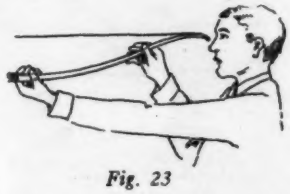


Fig. 23

Next, sight the bow as shown in Figure 23, to see if the bending has been properly done. If not, the bow may have to be steamed over again.

It may be noticed that after the bow has dried, the curve has probably straightened out a bit, but just as with *following the string*, there will be only a definite amount of flattening out, after which the curve will remain the same.

After the tillering and scraping have been done, the bow

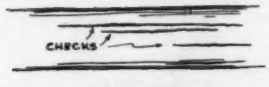


Fig. 24

is ready for finishing. Lemonwood takes walnut stain very nicely. Lemonwood may show up small flaws at this stage of the work. These appear in the form of checks as shown in Figure 24. Should these checks show up at the curves, it would be well to wrap the bow at this point with fine

Fig. 25

hemp or heavy silk set in glue, as shown in Figure 25. Buttonhole silk answers the purpose very well for this. Wrapping a bow does not harm its looks, in fact it sometimes adds to its appearance, and it has saved many a bow from breaking.

Backed Bows

Bows may be backed in a number of ways. Sometimes a bow is backed with a thin piece of hickory which is the toughest of all bow woods, but usually the backings are fiber or rawhide. Fiber is the easiest to obtain and to apply, and rawhide, while probably the best, is also the trickiest to apply. The backing is used mainly to keep the bow from breaking. It does not, however, add much cast to the bow.

A hickory-backed walnut bow, which has been in use for over two years, is still in good condition. One large recurved walnut bow with fiber backing shot a flight arrow 341 yards.

For a hickory-backed walnut bow, choose walnut that is straight-grained, and the hickory should be straight-grained whitewood or sapwood. The back of this bow, or rather where the two are glued together, must be planed perfectly flat, with a hand or a power jointer.

The pattern or lines of the bow should be of the flat-bow type described in this article. The piece of walnut should be about 6 ft. long by 1½ by ⅜ in. and planed as true as possible. The piece of hickory should be of the same length and width but only 3/16 in. thick.

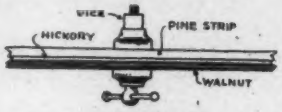


Fig. 26

Casein glue is the most reliable glue for any work on archery equipment. Mix this glue strictly according to the directions given by the manufacturer. If the glue is too thin or too thick it will not function properly.

Before beginning the gluing operation, get the clamps ready. A piece of 1 by 2-in. pine, 6 ft. long, also will be required. If iron C clamps are being used, have some small thin pieces of wood or cardboard ready to put under the jaws to prevent disfiguring the bow stave. The iron vise may also be used as an additional clamp.

Put a thin layer of glue on each jointed face and let it set for 20 minutes. To eliminate all lumps, smooth the glue with the fingers.

Next spread a thick second layer of glue over each piece and then place the two together. Put the piece of 2-in. pine back of the hickory and put the whole in the vise, as shown in Figure 26.

Then place the other clamps at regular intervals along on both sides of the vise. As many as 16 clamps plus the vise may be used on a 6-ft. bow. Be careful that the pieces of wood do not slip sidewise while applying the pressure.

If the worker has no clamps, he may wrap the three pieces of wood with a good piece of washline. To do this, after placing the two glued pieces together, let them remain a few minutes under some slight pressure, and after placing the pine strip next to the hickory, tie the ends with a piece of heavy cord or rope. Then proceed to wrap the three pieces of wood spirally as tight as possible with the rope. Then drive small wedges under the rope at intervals to further

Fig. 27

Fig. 28

increase the pressure. Figure 27 shows such a wrapped bow. Notice that the pressure is great enough to cause the glue to ooze out on both sides. Allow the glue to dry for at least 24 hours; 48 would be better. Do not try to bend the bow for a week at least. The stave can be worked into shape without being bent. When the clamps or ropes are off, scrape off the glue on the edges and then proceed as with the flat bow. Round off the belly or walnut part of the bow a little more than the back which should have only a slight curve. See Figure 28.

The handle is glued on as on any flat bow. It may be made of walnut or of a light wood for contrast. It may also be wrapped with a light trolling line if so desired. Then the bow must be tillered until the correct curve is attained.

The man who wants to back his bow with fiber has four colors of fiber to choose from; red, black, gray, and white. There doesn't seem to be any difference between these colored fibers as far as strength is concerned.

Fiber can be bought at electrical supply houses, and in some cities there are dealers who sell fiber only. It should be at least 1/16 in. thick, but no thicker than 3/32 in. It would be better if it could be obtained in 5½ to 6-ft. lengths, but it usually comes in 3-ft. sheets from which the strips are cut. They must then be butted together in the center of the grip or handle, and a piece of the same wood used for the grip, about ⅛ in. thick should be glued over the handle on the back. A fiber-backed bow is made the same as the flat bow already described, with the exception of the back which is not to be rounded at all.

Cut the strips of fiber a trifle narrower than the stave. The fiber must then be soaked in warm water for several hours. In the meantime, prepare the casein glue and then tear up some strips of light canvas, duck, or muslin into strips from 1 to 1½ in. wide. The longer these strips are, the better. By this time the fiber should be soft and pliable, but it should not be allowed to become too flexible.

Fig. 29

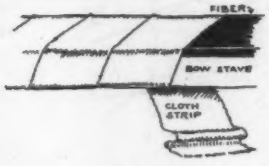


Fig. 30

Fig. 31

Wipe the surplus water off the fiber, and coat one side with glue. Give the wood a coat of glue also, and let both lie for a few minutes until the glue is tacky, but not dry. Then apply a good second coat of glue over the fiber and lay it on the wood. Whether the fiber is in one long piece or in two short pieces, the wrapping should start at the handle, and go both ways. *Stretch the fiber* by pulling with the hands only, and wrap it carefully to the ends. With the aid of an assistant this wrapping job may be easily done. In the absence of a helper, fasten one end of the cloth in a vise and roll the bow along it, as shown in Figure 29, being careful to keep the fiber centered on the wood. The cloth should overlap as you go along. See Figure 30. Don't be afraid of getting glue on the hands, as this is a rather messy job. Wrap right up to the ends and tie with a piece of string. When you are through with the wrapping, let the glue dry thoroughly before the wrapping is taken off. This may take several days. The bow is then formed like any other bow, and if the glue job has been well done, one need have no fear of the fiber loosening up while working on the bow. Shape it as shown in Figure 31, and glue a thin piece of wood about 4 in. long over the fiber at the handle to round it off nicer. Fiber takes a beautiful finish after it has been sanded down, but as some kinds have rather rough surfaces, it takes quite a bit of sanding to get it smooth.

While casein glue is waterproof, it is always good policy to varnish backed bows and keep them away from excessive heat, cold, and dampness.

While on the subject of backed bows, a word might be said about rawhide backing. Several archery-supply houses sell backed staves on which the rawhide has the thickness of heavy wrapping paper. Rawhide can be obtained, however, which is ⅛ in. thick. With such a substantial backing, a beautiful bow may be made, but to make it requires much work and experience. Furthermore, these bows are not to be looked upon as indestructible. They must be handled with care at all times, and should not be drawn further than the draw they were made for. This means that if a bow has been used for shooting 28-in. arrows, it should not be tried out to see how far it will shoot one that is 30 in. long. It might shoot farther, and then again it might just snap in two, and probably give the incautious archer a good crack across the head.

Care of the Bow

Some archers use an oiled rag for wiping their bows before putting them away. Others use regular furniture wax. The latter method is preferable because it gives the bow a more lasting coating.

Arrows should be treated in the same manner.

Do not throw a bow down on the ground or on the grass. If dampness doesn't harm it, someone may step on it. Set it up against a tree or shrub where it is out of the way. When carrying a bow on the train, in a street car, or in an auto, it is good policy to have a bow case.

At home, the bows should be hung up where the temperature remains fairly uniform. Some archers build a rack for their bows.

Do not let anyone try your bow to see how it pulls unless with an arrow in place, and let it be your own arrow. He may be using a longer arrow.

Playfully snapping the taut string of a bow is just as bad as snapping the trigger on an unloaded gun.

When a bow has assumed a curve, that is, when it follows the string when unstrung, do not try to bend it backwards. If it is a good bow, it will not alter its shape after it has once assumed a certain set.

Don't keep a bow strung when not in use.

Extreme heat or cold do not help the bow in any way. In very cold weather, it is apt to break, and in very warm weather, it loses cast.

SHIELD WALL PLAQUE

Jos. J. Lukowitz, Milwaukee, Wisconsin

The wall plaques shown in Figure 1 illustrate a project which appeals very strongly to all boys. This project can be successfully used with 5A and 6B classes. Details for the shield are given in Figure 2. Basswood is a good wood for this project. Cutting the shield presents no special problem, and attention is called to the fact that other shapes might be substituted for the shield.

Figure 3 gives three full-sized carving subjects. Avoid any subject which shows the human head viewed from the front. Such subjects do not work out well in this type of carving, and very unsatisfactory and even ludicrous results are obtained. Subjects having very minute detail should also be avoided unless this detail can be eliminated.

A 1/16-in. straight carver's gouge is the only tool required for the carving. This gouge, however, as it comes from the manufacturer is not correctly sharpened for this work. Figure 11, on page 323 of the October, 1934, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, illustrates the type of gouge to be used, and also the method of sharpening. Too much stress cannot be placed on the importance of correct

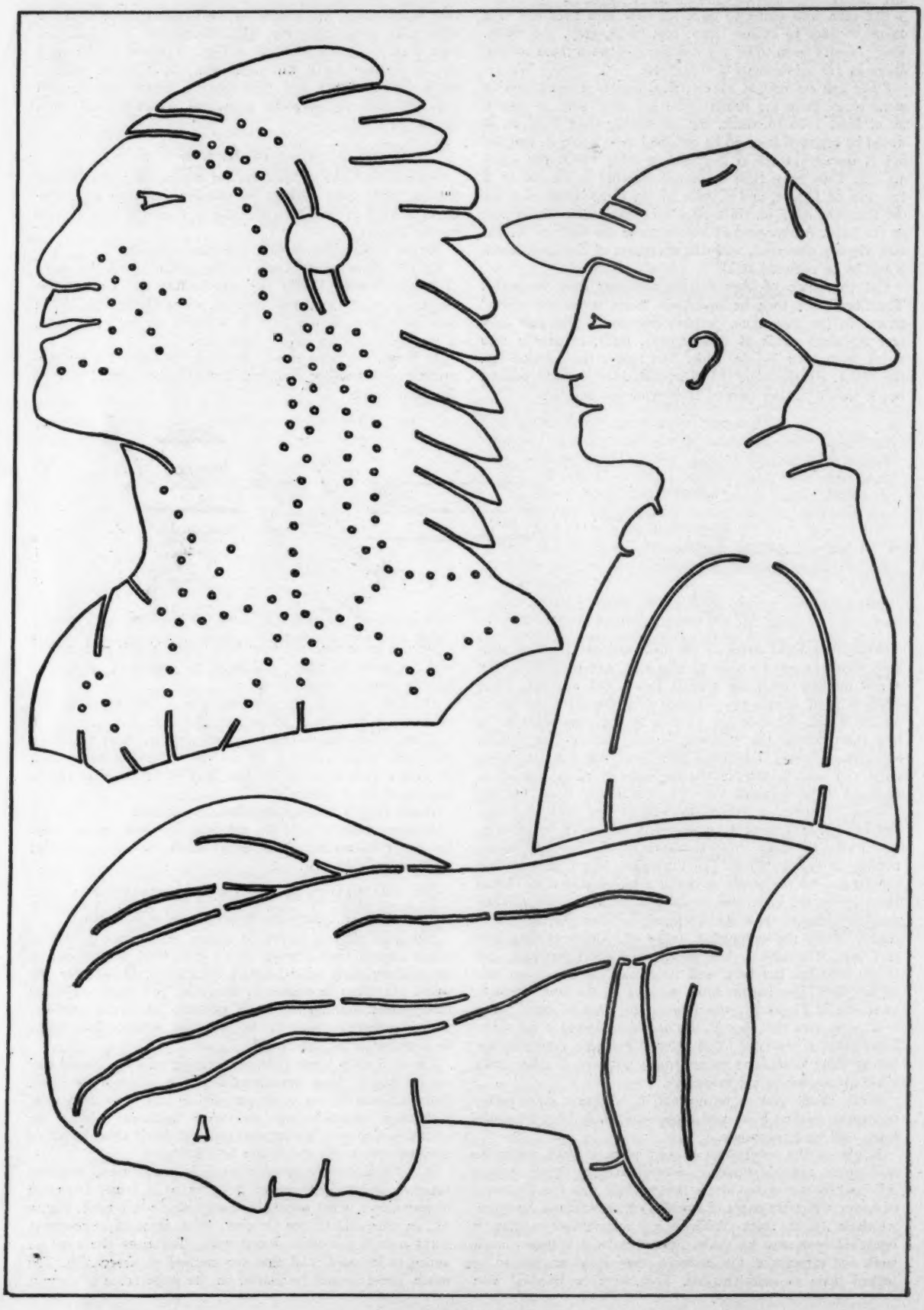


Fig. 3. Full-size template

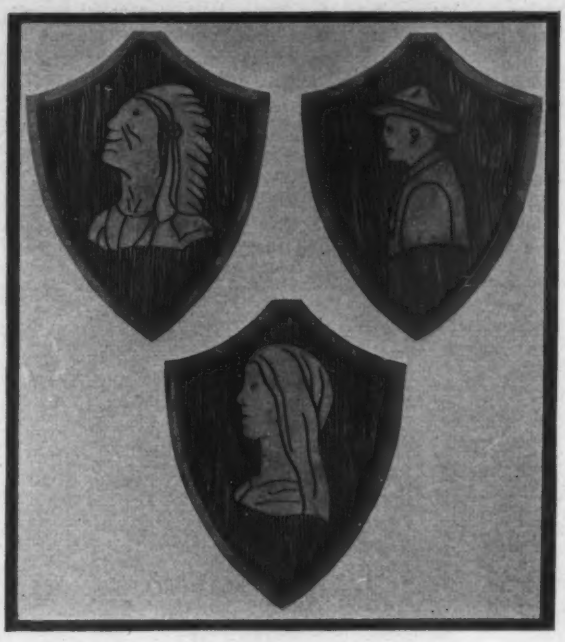


Fig. 1. Examples of finished plaques

sharpening. The gouge must be ground away more at the center as described in the article just mentioned, so that the boy will have little trouble in making clean cuts across the grain.

Templates

It is well to make metal templates of the subjects shown in Figure 3. The October, 1934, issue of this magazine, previously referred to describes the advantages of metal templates and how they may be cut with a coping saw.

Two types of templates are shown in Figure 3. The inside details of the Indian are marked with holes drilled in the template. In the other two template designs the inside details are sawed. When this latter method is used, tiny pieces of metal are soldered in the grooves at various points to strengthen the template.

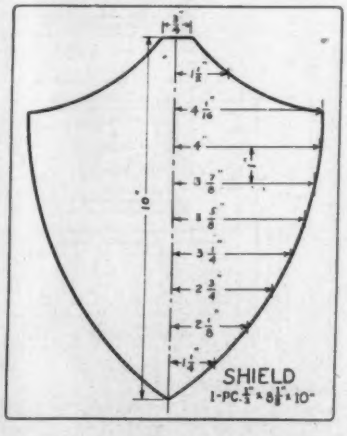


Fig. 2. Detail of the shield

Transferring the Design to the Plaque

When a large group of boys, or an entire class, requires the same template, a very great saving of time can be effected by transferring the design to the wood by rubbing

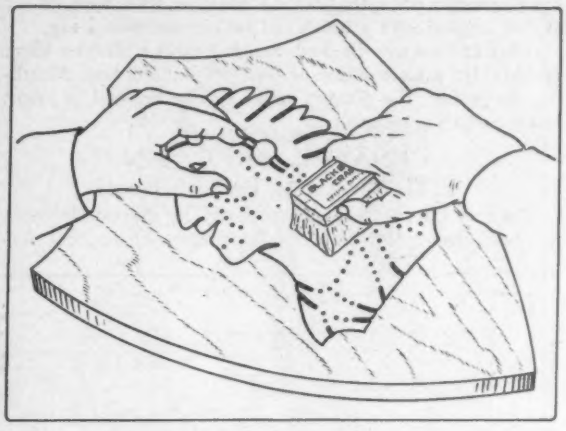
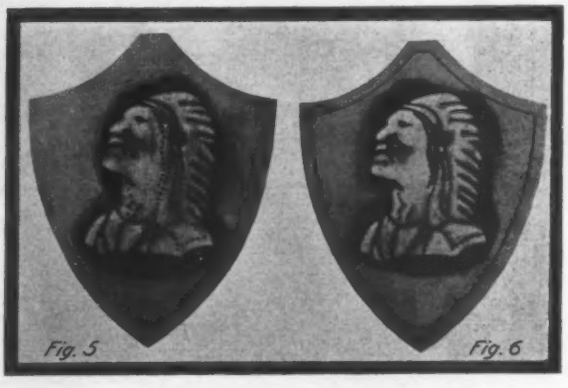


Fig. 4. Transferring the design



Figs. 5 and 6. Transferred and outlined design ready for carving

over the template with a blackboard eraser charged with any fine dry color, such as burnt turkey umber or chrome green. A very small quantity of this dry color will make hundreds of reproductions. Figure 4 shows how to rub the eraser over the template. The eraser should be rubbed back and forth and crosswise with considerable pressure. Experience will show how much powder to use. Remove the template carefully and blow off the excess powder. Strange as it may seem, better results are not obtained by tapping the eraser over the template or by using a dry brush with the powder. Figure 5 shows a plaque on which a design has been transferred as described in the foregoing. The instructor or a boy can transfer a large number of these designs in a very short time by this method. Each boy then outlines the subject and connects the stenciled portions with a pencil. Figure 6 shows the plaque outlined with pencil ready for carving. A 3/8-in. border is scribed with finger and pencil.

It is not necessary to have a gouge for each boy in the class. In a class of 24, for example, if 12 gouges are available, half of the class may work, say, ten minutes while the others watch. Then the other half may work ten minutes. This method also rests the boys' muscles and better work is produced.

Finishing

The plaques in Figure 1 were finished in the following manner. First, a thin sizing coat of shellac was applied. When thoroughly dry, this was sanded with very fine finishing paper. The sanding dust should be brushed out of the grooves, blowing will not remove it all. Next, a coat of white enamel is applied. This is followed by a second coat, and when that

has thoroughly dried, the plaque is antiqued with burnt umber and oil applied with a brush and rubbed out with a rag.

Other finishes may be used. Staining gives a pleasing effect provided the grain markings are not pronounced, thus disturbing the profile. The plaques might also be finished in bright colors and then antiqued.

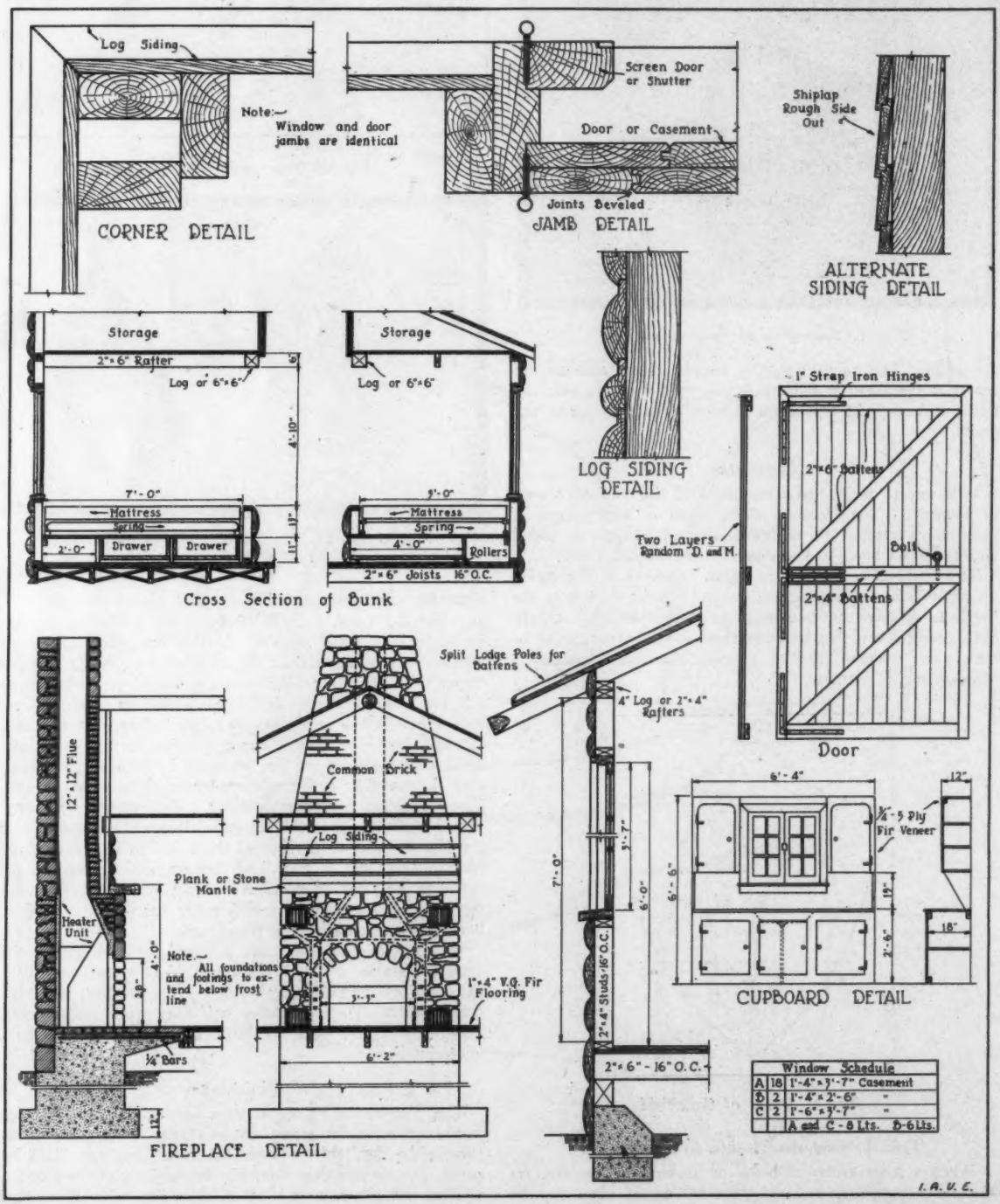
A SNAPPY LOG CABIN

W. Don Smith, St. Paul, Minnesota

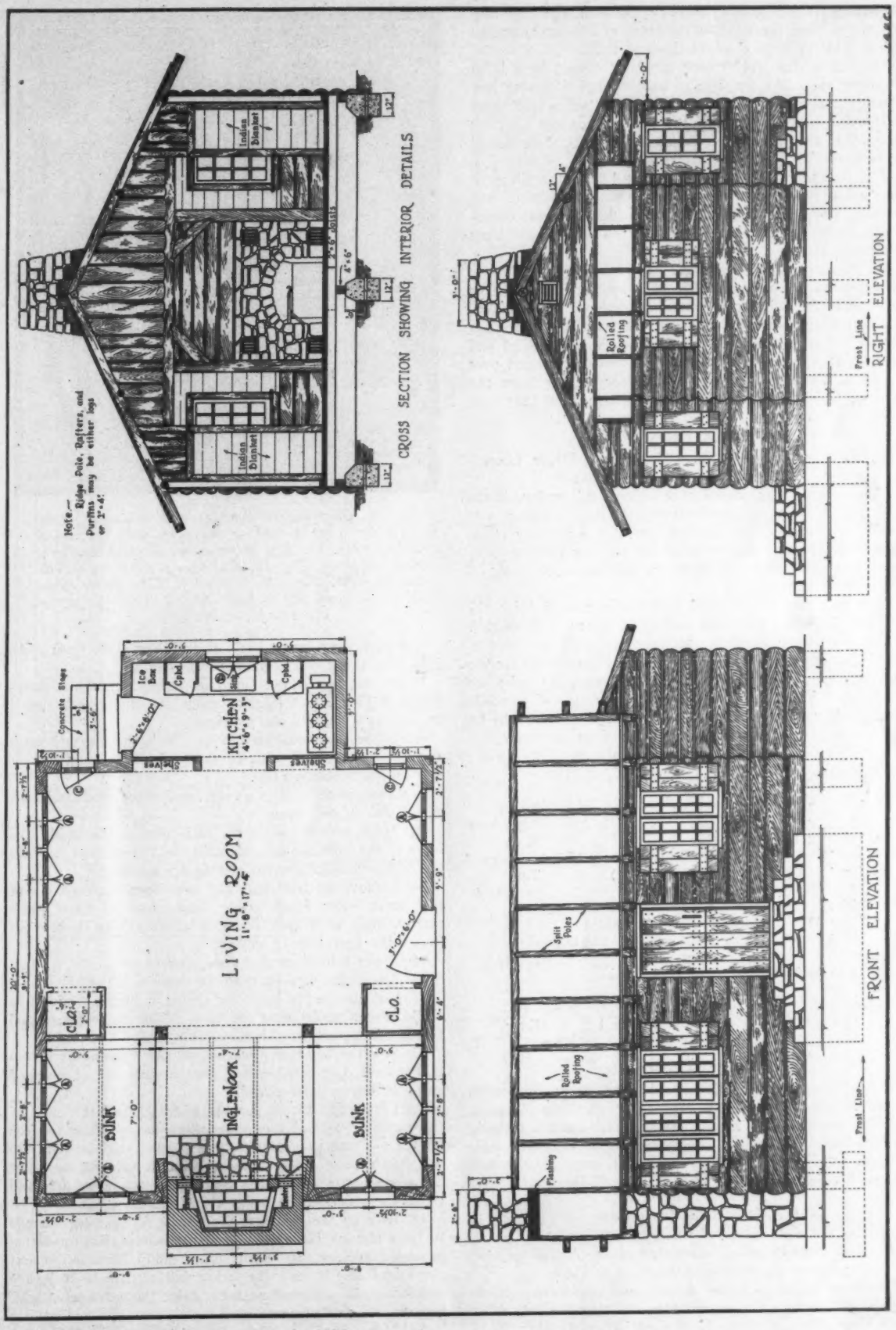
There is compactness and economy in the simple cabin described herewith. It suggests the rough outdoors, but furnishes the conveniences of a home. It is economical in cost. Four hundred dollars and a good industrial-arts shop for milling, supported by the efforts of the teacher himself, should make possible this snappy cabin.

Logs, log siding, or shiplap can be used for weatherboard. The rubberoid roofing is laid flat with split lodge poles securely nailed along each seam. This adds to the rustic appearance and gives a good weatherproof covering.

Casement windows are used. The doors are built up of random-width D and M boards with the joints beveled to give the effect of plank construction. These doors are made



Details of log cabin



Plan and Elevation of Log Cabin

in two sections, jointed halfway between the top and bottom, as were the doors of so many of the early settlers' cabins. This gives good ventilation and light.

There is a large cobblestone fireplace, flanked by a bunk on either side. The fireplace is built around a heating unit (there are several of them on the market, selling for about $60) which converts the old-fashioned fireplace into a regular furnace. If the proper size of unit is installed, there should be little need for a heating stove.

The bunks have full-size springs and take the place of the usual bedrooms, thus saving space, furniture, and expense. The bunks are equipped with Indian-blanket drapes which insure privacy when needed. At the foot of each bunk is a small closet.

On the end of the living room opposite to the fireplace is an archway, flanked on either side by bookshelves. This archway leads to a compact but well-equipped kitchen, containing built-in cupboards and sink, and with adequate space for an icebox and oilstove. The kitchen is well lighted and ventilated by a casement window conveniently located over the sink. There is also an outside door leading from the kitchen, which is of the same construction as is the front door.

PACK FRAME

R. J. Fox, General Shop Teacher, Willow Glen School, San Jose, California

The most popular project ever built in this region, is the pack frame. If you have a hobby of hunting or fishing, you know only too well the disadvantages of the ordinary knapsack. A pack frame aids materially in carrying a heavy pack, keeps irregular objects off the spine, and allows circulation of air over the entire back.

This plan is not submitted as being a cure-all for back-packing problems, but until something better is developed, it may well serve as a basis for experiment. Always bear in mind that boys grow rapidly, and on that basis build for the future as well for the present. If the frames are to be the property of a troop of scouts, the frames may well be made in a variety of widths and lengths, but if they are to be the property of individual boys, make them as nearly full size as possible. An adult will require a pack 16 by 30 in., while a boy's may be made 15 by 28, 26, or 24 in.

Bill of Material

2 pc. 1	x 1½ x 30	Spruce	Frame
2 pc. ¼	x 1⅜ x 15	Oak	Bows
2 pc. 1⅝	x 15	Oak	Bows
1 pc. No. 11	x 21½	Market wire, or use ⅛-in. welding rod	
1 pc. 5 x 5		Copper (16-oz.)	Tip protectors
16 ¾-in.		Escutcheon pins	
3 pc. 3½ x 32		Upholstery webbing	
18 No. 0		Brass grommets and washers	
3 pc. 30 in.		Heavy cord	Lacing
1 pc. 15 to 20 ft.		Sash cord	
2 pc.		Sponge rubber	
6 No. 108		Screw eyes	
2		Flour sacks or 1 mash sack	Kitty

Tools and Materials

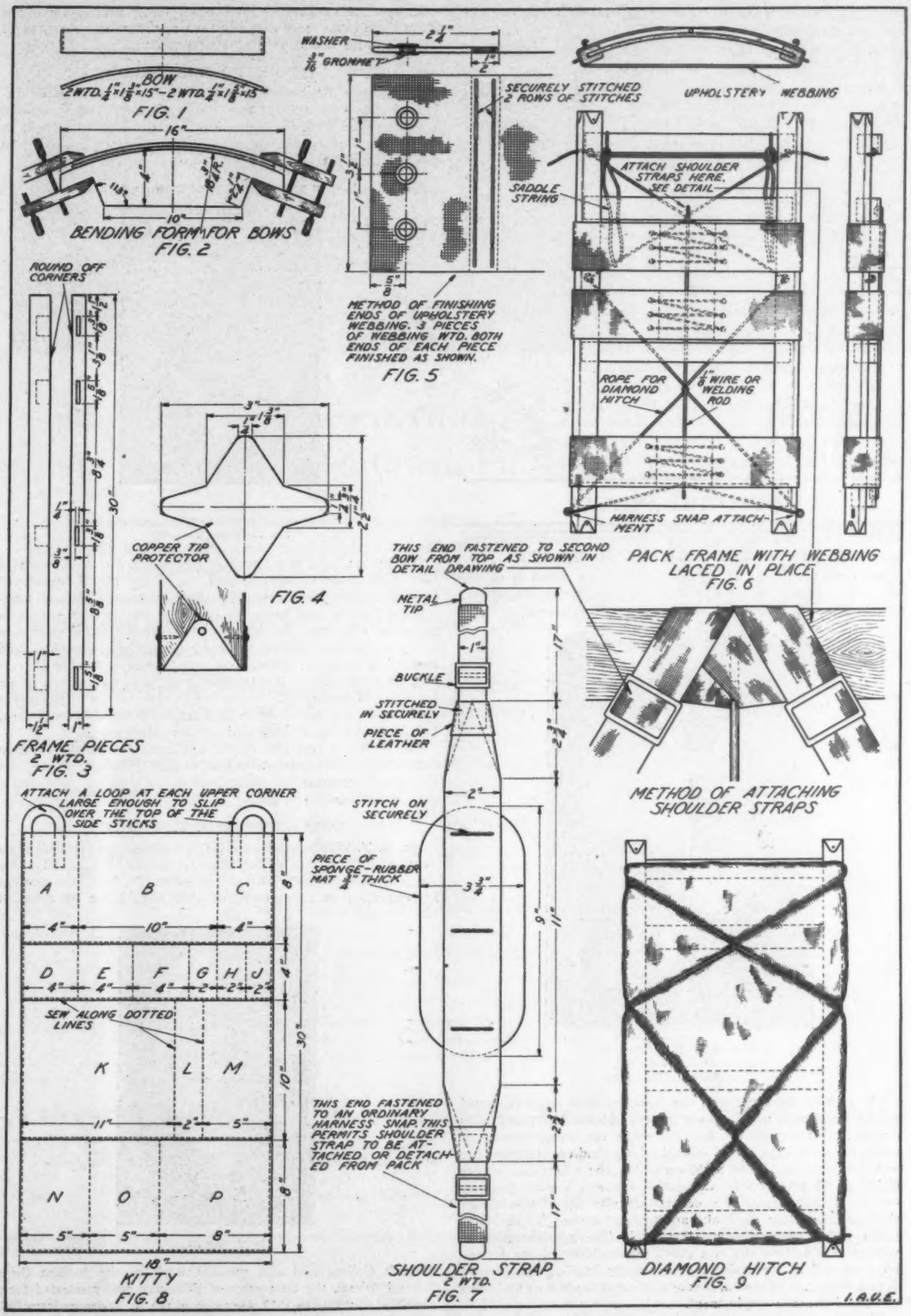
Saw, plane, hammer, chisel, mallet, sandpaper, steel wool, glue, shellac, varnish, brush scraper, grommet punch, canvas needle, shoemaker's thread, beeswax, try-square, marking gauge, knife, rule, pencil, bench vise, metal vise, adjustable clamps, steel clamps, dividers, brace, bit, snips, scratch awl, pliers, bending form, hand drill, drill, wash boiler.

Method of Procedure

1. Cut the material for the bows. See Figure 1.
2. Soak bows in boiling water until pliable enough to bend.
3. Place bows on bending form shown in Figure 2.
4. Plane edges of bows. Scrape and sandpaper surfaces clean. Be careful not to round edges or taper the ends.
5. Letter ends of bows A, B, C, D, E, F, G, H.

Fig. 10. Clay Sheets, age 12, with his pack on his back. His coat is tied to the pack with the saddle strings. Fig. 11. The diamond hitch which holds the pack in place. Fig. 12. Taking up slack on the diamond hitch. Fig. 13. At the left, Clay Sheets shows how the tump line is used. At the right, the writer, ready for the hike

6. Square lines across back of each bow 1 in. from ends. This is to check depths of mortises later on.
7. Lay out and cut the mortises in the two frame pieces shown at Figure 3. A marking gauge and sharp knife should be used in laying out the mortises.
8. Fit the mortises carefully to the bow ends and mark the mortise A, B, C, etc., to show which bow end will fit into the particular mortise.
9. Round off all corners on the frame pieces and sand both pieces smooth and clean.
10. Apply a thin coating of casein glue to the inside surfaces of the mortises and assemble and clamp the bows into the frame pieces. Allow the glue to dry thoroughly.
11. Remove all glue that may have been squeezed out at the joints, after which apply three coats of clear white shellac. Rub each coat down thoroughly with steel wool before the next coat is applied.
12. Apply a final coat of good spar varnish.
13. Attach the wire between the two 1⅝-in. bows.
14. Cut out the tip protector shown in Figure 4. Form to shape with a mallet over the ends of the frame pieces and attach the protectors with escutcheon pins.
15. Sew the hems on the ends of the webbing as shown in Figure 5. Use two needles, one on each end of a waxed string or heavy linen thread.
16. Locate the places for the grommets on the ends of the webbing. Spread the material of the webbing for the insertion of the grommets with a pointed stick or nail. Do not punch these holes or the grommets will pull out. Put the grommets in place, then put on one of the washers and crimp the grommets in place with a grommet punch.
17. Lace on the webbing. See Figure 6. Use steel clamps to force the oak bows to a smaller curvature. Tie the lacing in such a manner that it will untie readily, because the first time the frame is used, the lacing will need to be recinched to take up the stretched webbing. After the webbing is tight, remove the steel clamps.
18. Make two pack straps according to the dimensions


BOW
2 WTD. 1/4" x 1 3/8" x 15" - 2 WTD. 1/4" x 1 3/8" x 15"
FIG. 1
BENDING FORM FOR BOWS
FIG. 2
WASHER
3/16" GROMMET
SECURELY STITCHED 2 ROWS OF STITCHES
METHOD OF FINISHING ENDS OF UPHOLSTERY WEBBING. 3 PIECES OF WEBBING WTD. BOTH ENDS OF EACH PIECE FINISHED AS SHOWN.
FIG. 5
UPHOLSTERY WEBBING
ATTACH SHOULDER STRAPS HERE. SEE DETAIL
SADDLE STRING
ROPE FOR DIAMOND HITCH
3/8" WIRE OR WELDING ROD
HARNESS SNAP ATTACHMENT
PACK FRAME WITH WEBBING LACED IN PLACE
FIG. 6
ROUND OFF CORNERS
FRAME PIECES
2 WTD.
FIG. 3
COPPER TIP PROTECTOR
FIG. 4
THIS END FASTENED TO SECOND BOW FROM TOP AS SHOWN IN DETAIL DRAWING
METAL TIP
BUCKLE
STITCHED IN SECURELY
PIECE OF LEATHER
METHOD OF ATTACHING SHOULDER STRAPS
ATTACH A LOOP AT EACH UPPER CORNER LARGE ENOUGH TO SLIP OVER THE TOP OF THE SIDE STICKS
STITCH ON SECURELY
PIECE OF SPONGE-RUBBER MAT 1/4" THICK
SEW ALONG DOTTED LINES
THIS END FASTENED TO AN ORDINARY HARNESS SNAP. THIS PERMITS SHOULDER STRAP TO BE ATTACHED OR DETACHED FROM PACK
KITTY
FIG. 8
SHOULDER STRAP
2 WTD.
FIG. 7
DIAMOND HITCH
FIG. 9
I.A.V.E.

The lettered spaces shown on the kitty in Fig. 8 are for the following: A. first-aid kit. B. towel. C. turner, flashlight. D. handkerchief. E. film. F. soap. G. salt and pepper. H. tooth powder. I. matches. K. plate, oven, board. L. tooth brush. M. scout manual, maps. N. field glasses. O. camera, cup. P. mess kit, knife, fork, spoon

shown in Figure 6. Do all of the stitching with two needles and use good strong thread.

19. Attach the sponge-rubber pads at the shoulder straps. Again, use two needles to do the sewing.

20. Place the six screw eyes as shown in Figure 6. These have to be large enough to work well with the size of sash cord or buckskin thongs used to hitch the pack on the frame. Notice that four of the screw eyes have to be opened sidewise, two right and two left.

21. Make the kitty shown in Figure 8. Dye this some appropriate color. This kitty with the grub sack is rolled inside of the bedding. The whole pack is then laid high on the frame and hitched on securely with the diamond hitch shown in Figure 9.

22. The two leather thongs used as saddle strings are next attached to the frame where the top bows enter the frame pieces. The saddle strings are used for fastening such things as coats, etc., after the pack has been made up.

23. Attach a tump line if desired. This is a head strap used to steady the load and carry part of it. If a tump line is used, it is attached at the same point as the saddle strings. Unless you have Indian blood in your veins, you will probably not care for the tump line.

Personal News

ASSUMES INCREASED RESPONSIBILITIES

Mr. Dean M. Schweickhard has recently been placed in charge of the Department of Pupil Personnel in the Minneapolis, Minn., school system, with the title of Assistant Superintendent.

DEAN M. SCHWEICKHARD
Assistant Superintendent,
Minneapolis, Minnesota

The plan of organization in the Department of Pupil Personnel and Special Service presided over by Mr. Schweickhard plans many changes. This department has charge of the census service in which an up-to-date record is kept of all children of school age and their families, living in Minneapolis. The attendance service embraces all problems in attendance, truancy, visiting teachers, and pupil adjustment. This department also has charge of the child-guidance clinic, the health and hygiene service, and the vocational and educational counseling work. The administration of vocational education also is a direct responsibility of the department as well as the training of physically handicapped persons. It also takes care of the enforcement of street-trade laws and other phases of juvenile employment.

The duties of supervising a department which covers such a wide field are particularly burdensome under present conditions where there exists more critically than anywhere else the need of "new ways for new days."

APPOINTED DIRECTOR

Mr. Charles E. Barker, recently appointed Director of Industrial Arts Education at San Francisco, Calif., was promoted to this position from that of head of the drawing department in the Balboa High School. He succeeds Mr. Eugene Carniglia, who resigned from the position after 37 years' service.

CHARLES E. BARKER
Director of Industrial-Arts Education,
San Francisco, California

Mr. Barker, who is a native of Pittsburgh, Pa., took work at New York State College, Cornell University, the University of California, San Jose Teachers' College, and the Colorado Agricultural College, and holds the degree of bachelor of science in industrial education. He has had considerable trade experience as a mechanical draftsman, tool designer, patternmaker, and mechanical inspector, having been employed by a number of large business corporations. His teaching experience was gained as an instructor in mechanical drawing in the high schools of San Francisco during the period from 1925 to the present. Since August, 1933, he had been teaching in the Balboa High School.

Mr. Barker is president of the California Industrial-Education Association (Bay section) and is a past president of the San Francisco Vocational Association, and of the Colorado Agricultural College (industrial-arts group).

DEATH TAKES H. T. WILHITE

Mr. H. T. Wilhite, late professor of industrial arts at Ball State Teachers College, died at his home in Muncie, Ind., April 3. He was born at Crawfordsville, Ind., on August 26, 1871, and received his education in the schools of that city. Later he attended

H. T. WILHITE

Wabash College and also pursued work in the Indiana State Normal School, the University of Wisconsin and graduated from the Stout Institute in 1917. He received the A. B. degree from Ball State Teachers College in 1928.

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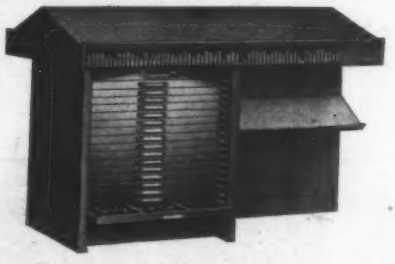

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Active members who attended the 25th Annual Meeting of the Manual Arts Conference of the Mississippi Valley, December 13 to 15, 1934, at Peoria, Illinois

Left to right, rear row: Dr. William H. Stone, Ohio State University; Dr. Louis V. Newkirk, Chicago Normal College, Chicago, Ill.; Arthur B. Mays, University of Illinois, Urbana, Ill.; John J. Metz, Industrial Arts and Vocational Education Magazine, Milwaukee, Wis.; Wayne Wetzel, State Teachers College, Macomb, Ill.; DeWitt Hunt, State A & M College, Stillwater, Okla.; Marion E. Franklin, State Teachers College, Tahlequah, Okla.; Joseph W. Paul, State Department of Education, Springfield, Ill.; Joseph G. Grove, State Teachers College, Commerce, Tex.; L. G. Lindahl, State Teachers College, Chadron, Nebr.; Hubert T. Wilhite, State Teachers College, Muncie, Ind.; L. L. Gore, Peabody College, Nashville, Tenn.; J. T. Mays, State Teachers College, Morehead, Ky.; Dr. Verne C. Fryklund, University of Minnesota, Minneapolis, Minn.

Third row: V. M. Russell, State Teachers College, Platteville, Wis.; Charles A. Bennett, Industrial Education Magazine, Peoria, Ill.; Ben W. Leib, State Teachers College, Kirksville, Mo.; Dr. Melvin S. Lewis, Indiana State University, Bloomington, Ind.; E. C. Phillips, University of Missouri, Columbia, Mo.; Fred C. Whitcomb, Miami University, Oxford, Ohio; Louis C. Petersen, State Normal University, Carbondale, Ill.; Dr. Homer J. Smith, University of Minnesota, Minneapolis, Minn.

Second row: Dr. William T. Bawden, Industrial Education Magazine, Peoria, Ill.; Allen T. Hamilton, State Department Education, Indianapolis, Ind.; Edward C. Weaver, State Teachers College, Kalamazoo, Mich.; Noel B. Grinstead, State Teachers College, Warrenburg, Mo.; James McKinney, American School, Chicago, Ill.; Dean M. Schweickhard, City Schools, Minneapolis, Minn.; Ammon Swope, Purdue University, Lafayette, Ind.; Charles H. Bailey, State Teachers College, Cedar Falls, Iowa; Dr. George E. Myers, University of Michigan, Ann Arbor, Mich.; Victor Randel, State Teachers College, Huntsville, Tex.; Daniel J. Crowley, State Teachers College, Bowling Green, Ohio; Roy A. Hinderman, University of Wisconsin, Madison, Wis.; E. C. McLaughlin, Ohio University, Athens, Ohio.

Front row: Marion J. Sherwood, State Teachers College, Kalamazoo, Mich.; Elroy W. Bollinger, University of North Dakota; Edward L. Williams, Texas State A & M College, College Station, Tex.; Merit L. Laubach, State Teachers College, Terre Haute, Ind.; Thomas Diamond, University of Michigan, Ann Arbor, Mich.; William E. Roberts, City Schools, Cleveland, Ohio; Adnah C. Newell, State Normal University, Normal, Ill.; Albert F. Siepert, Bradley Polytechnic Institute, Peoria, Ill.; Clyde A. Bowman, Stout Institute, Menomonie, Wis.; H. H. Braucher, University of Illinois, Urbana, Ill.; W. G. Wilson, Chicago Normal College, Chicago, Ill.; Robert W. Selvidge, University of Missouri, Columbia, Mo.; L. T. Smith, State Teachers College, Bowling Green, Ky.

He began his teaching career in Kokomo, Indiana, in 1910, later going to Logansport as director of vocational education. Then he was appointed director of industrial arts and vocational education at Crawfordsville. Since 1923, he has been associated with Ball State Teachers College.

Mr. Wilhite was a member of the Epsilon Pi Tau Fraternity, the Indiana Industrial Education Association and the National Education Association.

¶ Dr. Homer J. Smith will be guest professor during the third period, August 3 to 23, at Colorado Agricultural College, Fort Collins, Colo. He will teach one course in industrial-arts work and another in vocational guidance.

¶ Dr. Roy W. Roberts and Dr. L. L. Scranton, who have been appointed to the staff of the U. S. Office of Education for a period of three months, will undertake the preparation of teaching material for use in vocational-agriculture classes in secondary schools.

¶ Dr. Verne C. Fryklund will be guest professor on the graduate faculty of the Kansas State Teachers College, Pittsburg, Kans., for the summer session, June 3 to August 2.

¶ Dean M. Schweickhard, assistant superintendent, Minneapolis, Minn., will give two teacher-training courses of two weeks' duration each, at the Utah State Agricultural College at Logan, Utah.

The one course will be on "Principles of Vocational Education." The other will be on "Methods of Teaching Industrial Arts."

¶ Mr. C. C. Gould has occupied the position of supervisor of industrial arts in the high school at Huntington, W. Va., since 1914, with an interruption of but two years.

In our last issue it was erroneously reported that E. L. Waltz had been appointed supervisor in that city. We are sorry that this error was made.

¶ Mr. Herbert Bast, author of *Essentials of Upholstering*, will teach a course in upholstering during the summer course at the Colorado Agricultural College, Fort Collins, Colo., July 15 to August 2.

¶ J. A. Bell, of Kansas City, Mo., is instructor for a group of plumbers' apprentices in the Lathrop Polytechnic Institute.

¶ F. W. Hebberger, a teacher of sheet-metal work in the Hadley Vocational School, St. Louis, Mo., is on a two months' leave of absence for the purpose of making a vocational survey of the industries in the state penal institutions. The findings of the survey will be used in outlining a training program for such institutions.

¶ Four vacancies on the staff of the vocational-education division of the U. S. Office of Education have been filled recently. Miss Rua Van Horn has been appointed federal agent in home economics for the Southern States; Mrs. Dora S. Lewis, federal agent in home economics for the Pacific States; Miss Susan Burson, agent for special home-economics groups; and John B. McClelland, specialist in agricultural education.

Associations, Conventions

CONNECTICUT CONFERENCE POSTPONED

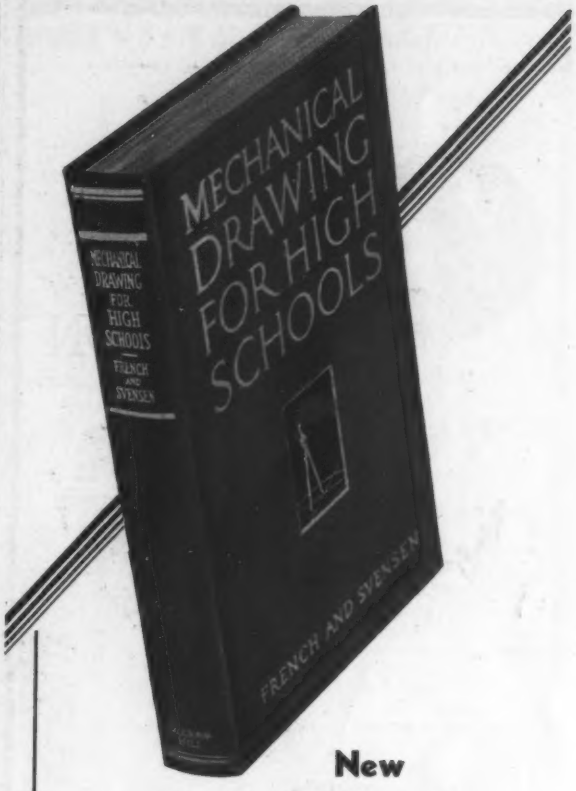
The Connecticut Industrial-Arts Association convention will be held on May 25 and 26, instead of on May 24 and 25, as previously announced.

INDIANA INDUSTRIAL-EDUCATION SOCIETY MEETS IN TERRE HAUTE

The fourth annual meeting of the Indiana Industrial-Education Association was held March 29 to 30, in the State Teachers' College at Terre Haute. The meeting attracted a large attendance, with members present from the state at large as well as from surrounding states.

A feature of the program on Friday afternoon was a discussion of industrial arts from three aspects. "Industrial Arts from the Trustees' Point of View" was discussed by Mr. J. T. Sankey; "The Industrial-Arts Curriculum" was handled by Mr. W. G. Bate, of Richmond; and "Industrial Arts in Modern Education" was taken by Dr. J. W. Jones of the Indiana Teachers' College.

A number of sectional meetings in aviation, automotive mechanics, drafting, electricity, foundry work and patternmaking, general shop, machine shop, printing, related subjects, rural shop, and woodwork were held. Mr. S. M. Pierce conducted a Wind Tunnel Demonstration, Mr. Laubach presented Possible Contribution of Mechanical Drawing to the Seven Objectives of Education, Mr.



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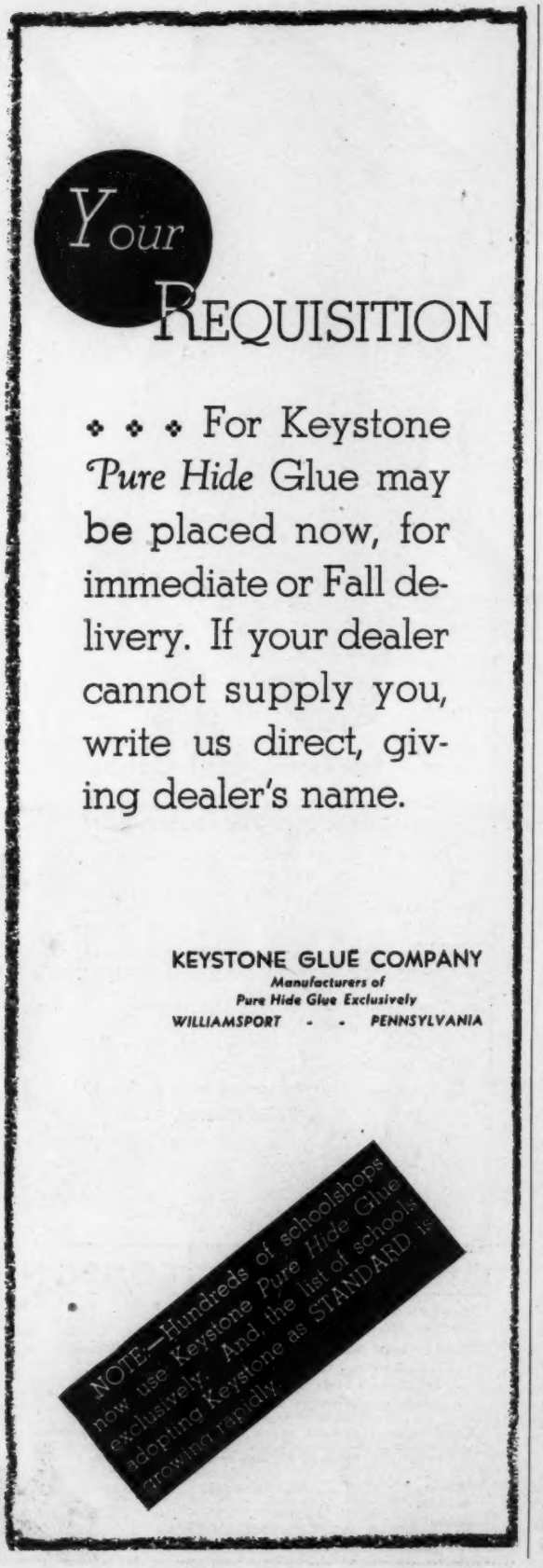
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Leonard Crow conducted Demonstrations in Alternating-Current Phenomena, Mr. A. H. Luehring offered a Demonstration in Brass and Aluminum Founding, and Mr. Sink and his group conducted a Demonstration on the General Shop.

The annual banquet, held in the Women's Residence Hall, was attended by 400 members of the Association. Mr. Allen T. Hamilton, State Supervisor of Industrial Education, acted as toastmaster.

At the general meeting on Saturday morning, Prof. A. B. Mays, of Illinois University, discussed the topic, "The Relation of Industrial Education to General Education," pointing out the features of industrial education which contribute most to general education. He emphasized that the new philosophy of education has made it possible for industrial arts to play an increasingly important part in the future development of the educational program, due to the recognition of the necessity of building the educational program around the present needs of pupils.

An outstanding feature of the meeting was the exhibit of industrial-arts work, which comprised a varied display of practically all phases of industrial-arts activity. The exhibit attracted a great many citizens of Terre Haute and the vicinity who visited the displays. There was an extensive exhibit of books and book material, as well as a representation of an old-type woodshop, with dirty benches, disorderly appearance, and a modern shop with an up-to-date teacher, equipment, and new activities. The commercial exhibit was varied and complete and contributed greatly to the success of the convention.

It was voted to hold the next meeting in Fort Wayne.

At the business session, the following officers were elected for the next year: President, Mr. S. A. Yager, Indiana State Training School; vice-president, Mr. David Sellers, Fort Wayne; secretary-treasurer, Mr. H. G. McComb, Purdue University.—*S. Y. Yager.*

WESTERN ARTS ASSOCIATION CONVENTION

With an almost unprecedented attendance, the Western Arts Association Convention got under way on its 41st meeting, in the Stevens Hotel at Chicago, Ill., on Wednesday, April 3, 1935.

The art teachers, of course, were in the preponderance and as the days went by, one could not help but feel sorry that so few of the teachers interested in industrial-arts work had an opportunity to attend the fine series of meetings which had been arranged for them this year. The only answer, no doubt, is that the shop teachers find it very difficult to get away for meetings that are held on Wednesday and Thursday.

The general theme of the convention, "Stimulating the American Arts," was carried through very effectively. The first industrial-arts section meeting, Wednesday afternoon, had chosen for its theme, "The Changing Curriculum of Industrial Arts." Dr. Louis Newkirk, Director of In-Service Training, Chicago Public Schools and Chicago Normal College, presided.

Robert B. Shumway, of Rockford, Ill., showed how a course in home engineering for girls can be made to function and what can be expected of work of this kind. Frank C. Moore outlined an industrial-arts program which would fit present conditions. D. W. Castle, Joliet, Ill., showed that subjects such as auto mechanics, besides their practical content, can also have cultural values. LeVerne T. Ryder, President, National Home Workshop Guild, Inc., Rockford, Ill., gave an interesting account of the origination and growth of the National Home Workshop Guild, and Elmer W. Christy, Cincinnati, Ohio, described the work of the National Conference on Industrial-Arts Education which had been called by Dr. M. M. Proffitt of the U. S. Office of Education in Washington, in November, 1934. He also explained the work that has been done by the members of this Conference since then, and what there is still to be accomplished.

At the general session, Wednesday evening, G. H. Hargitt, Supervisor of Industrial Arts, St. Louis, Mo., presided. After Dr. William J. Bogan's address of welcome, President Fillette Many, spoke on "Stimulating the American Arts." In her speech, she emphasized the fact that the arts are a psychological necessity in this age. The speaker called attention to the fact that since the school is a definite agency for teaching the appreciation of beauty, the teachers themselves must be creative leaders. Grant Wood spoke on "Regional Art in America." "Modernism," he said, "aims at design only, while the regional painters combine design and content."

At the drafting section, Thursday morning, N. F. Fultz, Director of Vocational Education, Sterling Morton Township High School and Junior College, Cicero, Ill., presided.

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Arthur B. Mays, in his talk on "The Enrichment of Mechanical-Drawing Courses," deplored the fact that this subject, one of the earliest of the manual-arts courses, has suffered so from traditions that it has not progressed as fast as some of the other industrial-arts subjects. He showed that mechanical drawing if properly developed offers opportunity for integrating all the courses offered in the school, especially those having to do with mathematics, English, and the physical sciences.

Dr. Robert C. Woellner, in his talk on "Drawing for the General Student," showed that drawing as a means of expression may and should be worked out in such a manner that it develops thoughtful attitudes in the student.

Julius Tarling, in his "Architectural Drafting as a High School Subject," advocated that two years of general drawing be given the student before he commences architectural drawing and that after two years of architectural drawing, vocational work should be emphasized so that out of these courses might be developed the apprentices who will later become architects.

H. D. Campbell spoke about the need for standardizing drafting methods. He pointed out that while drafting is called a universal language, it needs much organization and explanation to make it generally understood.

Walter G. Hjerstedt explained the work that had been done by him and his students in the International Drawing Exchange, the aim of which is to find out from other countries what they are teaching their drafting students and also to acquaint them with what is being done in this country.

At the Industrial Arts and Vocational Education section on Friday, Robert D. Gregg, special assistant to the superintendent of schools, Chicago, presided. At this meeting, Roy R. Van Duzee, chairman of the A.V.A. Committee on Testing, described what had been done by his committee in developing techniques which could be used for testing the intangible outcomes of industrial arts and vocational education.

Dr. William L. Hunter, in speaking on the subject "Industrial Arts in 1960," prophesied that the emphasis of the industrial-arts work in the future would be less on skills and techniques and more on art and design. He also described the physical aspects of the school shop in 1960. If his predictions come true, the shop teacher of the future will work under conditions quite different from those found in many of the school shops today.

Dr. Louis Newkirk spoke at length on industrial arts in modern education.

At the Epsilon Pi Tau banquet on Friday evening, Albert W. Evans, Principal, Tilden Technical High School, Chicago, was toastmaster. The subjects discussed at this meeting were the 1935 Symposium on Research and the proposal for the content of the 1936 Annual. Speakers at this occasion were Orville E. Sink, Charles A. Bennett, Raymond W. Phipps, Lawrence F. Ashley, and Dr. William E. Warner.

At the business meeting, Frank C. Moore, Supervisor of Industrial Arts, Cleveland, Ohio, was elected president; J. Betsy Willing, Associate Professor in charge of Art Education, College of Education, Wayne University, Detroit, Mich., vice-president; Harry E. Wood, Director Practical Arts and Vocational Education, Indianapolis, Ind., secretary-treasurer.

The next convention will be held at Nashville, Tennessee.

THE SCHOOL CRAFTS CLUB MEETING

The School Crafts Club of New York City held its regular monthly meeting on April 5.

Dr. Joseph I. Davidman, principal of the Mangin Junior High School in New York City, the principal speaker, gave a talk on the subject, "What Principals Expect of Shopwork Teachers." He outlined five general expectations, namely: (1) professional attitudes, (2) instructional ability, (3) ability to maintain dynamic discipline, (4) personal attributes or personal traits, and (5) routine reports, records, classroom economy, and systematic order.

Dr. Davidman emphasized that the teacher should require of himself the same professional efficiency as is demanded of other teachers. He should acquire the "teacher attitude," and should not retain the shop principle of driving for production, instead of teaching, and should refrain from the practice of "making things" an end in itself. He also stressed social service and co-operation through manual training and urged that shop teachers should not be outsiders but should become a part of all school activities. They should be practical idealists, having faith in the validity of educational philosophy and procedure, and should maintain a constant self-survey leading to continuous personal and professional growth.
— *Frank A. Russen.*

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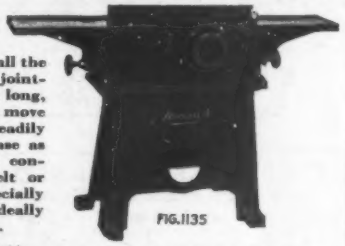

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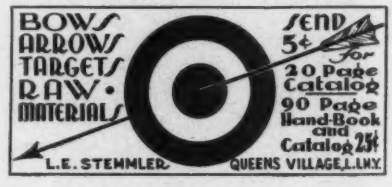

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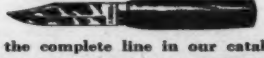

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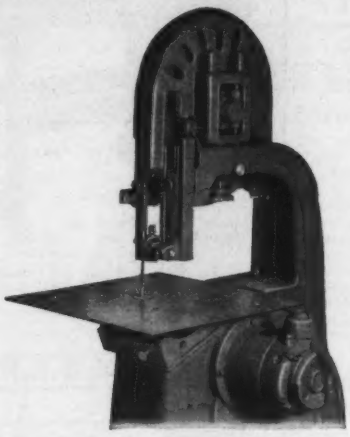

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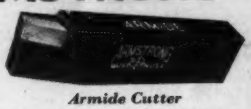

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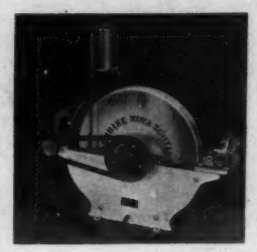

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